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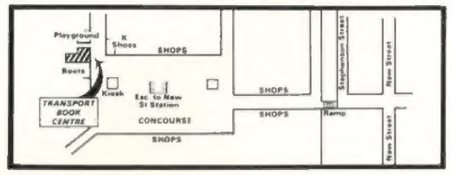

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aircraft illustrated

August 1983 Vol 16 No 8

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This month's cover features the piggy-backed Orbiter *Enterprise* on NASA 747 N905NA while at RAF Fairford on 20 May. Over 15,000 people crowded into the station for its one-hour refuelling stop-over en route to the Paris Air Show and 10 times that number flocked to Stansted on 5-7 June for the *Enterprise's* official visit. On pages 378-379, this issue, Alan Wright takes a look at the 'Shuttle fever' that gripped the UK for three days. *Photo: A. Watson*

Frontispiece: A pleasing study of Jet Provost T5As, XW365/73 and XW428/70 of 1 Flying Training School, RAF. The School is the subject of a feature by Robin Sinton that begins on page 349, this issue. *Photo: RAF Linton-on-Ouse*

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airscan

Paul Humphreys

A DISCUSSION over a croissant, café noir and aspirin breakfast in one of the Paris Show company chalets led your man, as one of a multi-national group of aviation journalists with a historical bent, to muse on the fact that there is very little which is new under the sun — particularly in the weird world of aerospace.

Hot air balloons? Haven't you heard that this is the bicentenary of the first manned balloon flight? Helicopters? A chap named Leonardo who hailed from a place called Vinci in Italy was into rotary wing design back in the 15th Century — although it was not until 1907 that man first got airborne in a 'chopper', the Breguet-Richet design. Scimitar blades on propellers? Watts and others did it 70 years ago. Anhedral wing tips? Have a look at the Heinkel 162 Volksjaegers in the *Musée de l'Air* or half a dozen other collections. And rockets? Your average Chinese knew more about them 2,000 years ago than did Von Braun or Opel.

Talking of the inscrutable orientals we fell to discussing the practice of making 'chinese copies'. Strangely, as far as aircraft are concerned, the People's Republic of China has not been noted for copying the designs of other nation's aircraft manufacturers. True, the State Aircraft Factories at Shenyang, Nanzhang and Xian have been busy turning out many hundreds of licenced-built MiG-15, 17, 19 and 21 variants plus Tu-16s and a number of Soviet light transport aircraft, but it was not until 1981 that the Chinese aircraft industry appeared to be advancing by copying the well tried and proved Boeing 707 design in producing the Y-10.

By now fortified by the excellence of the local boulengerie's products, and restored by the coffee and caffeine, our little group of enthusiasts began emptying our mental storehouses to discover which country is the most avid copyist. Over the years the Soviet Union has not been averse to 'plane plagiarism. The Li-2/Dakota and the Bull/B-29 of the 1940s and '50s are evidence of this. More recently, the Il-62 closely resembled and was built concurrently with the VC10, and the Il-18 in its time caused many an aircraft recognition less-than-expert to confuse it with the good old Britannia. Italy's Fiat G91 of the 1950s clearly drew heavily on the F-86K and there is more than a passing resemblance between India's Kiran and Ajeet and Britain's Jet Provost and Gnat, respectively. When, in 1967, Israel Aircraft Industries acquired all the tooling and the design and production rights for the North American Rockwell Jet Commander, it was not too long before the IAI Westwind — a dead ringer for the US-designed aircraft — came on to the marketplace. It was almost the same with the Nesher/Mirage IICJ of 1969, and today we see a re-engineered and re-engined variant with the name 'Kfir' flying with the IDF/AF and the *Fuerza Aerea Argentina*.

Israeli's IAI has, however, moved ahead of the copyist's game with the new Lavi. It looks very much like the F-16 in side view, but when one has a quick peek at the plan view then there are some changes — as there are with the addition of the canard surfaces up for'ard. It looks as if someone in the IAI project office has an entree to the Dassault advanced project team, or at least is on first name terms with someone working on the Mirage 2000 and 4000 design.

Two other countries with what appears to be a penchant for copying are Argentina and Yugoslavia. At Paris everyone who passed the FMA stand did a quick double-take when they saw the IA.63 jet trainer on the stand. 'What is an Alphajet doing on the FMA stand?', we all asked ourselves. The answer lay in the knowledge that there had been a great deal of assistance provided by the Dornier design office — and it was there for all to see. And now there is Jugoslavia's Soko Super Galeb, which appears to be a very close relative of the BAe Hawk.

Now, while all of these straight-copied, derivatives or variants are look alikes, they are not necessarily twins, or even brothers under the skin. It is, in fact, under the skin where the major differences occur. While metal can be cut and formed to produce an aerodynamic copy of someone else's aeroplane, all the kit inside cannot always be obtained from the original manufacturers. Thus indigenous equipment has to be created to meet the need and to fill the hollow envelope of the airframe. It is then that all the cg problems arise necessitating a small structural change here, a re-drawn contour there, a new access door over yonder and a change from 18 to 12 SWG skinning just about everywhere.

Yes, copying may speed creation of a much-needed new aeroplane; it may get it produced and into service more economically, but it requires almost as much skill to perform effectively as does the designing and building from scratch.

For ACA read EAP?

One of the things which one hoped to see clarified during the Paris Air Show pilgrimage was the definitions of the British Aerospace ACA and EAP. Readers of *Aircraft Illustrated* will know that these mnemonics mean 'Agile Combat Aircraft' and 'Experimental Aircraft Programme'.

The ACA full-scale mock-up was unveiled on the BAe stand at Farnborough last year, and a select band of British aerospace equipment companies — who have spent some £25 million of their own money promoting this aircraft, also displayed hardware for it. We had become comfortably aware of the ACA; we knew what it looks like and what it is intended to do. Then — whammo! Just before the Paris extravaganza got off the ground there was all this chat about the EAP. With gyros a-topple your correspondent, and many other aero-scribes no doubt, set out on this biennial visit to Le Bourget determined to clarify the situation.

Happily, during the show, British Aerospace went some way toward tidying-up the situation by announcing that the UK Government has signed a multi-million pound contract to build a demonstrator aircraft for a fighter of the future. This means that the

EAP will be based on the ACA. Still confused? You're not alone. Many British stands at the Show carried captions and messages declaring that the exhibits were intended to show that particular company's involvement with 'a tri-national technology demonstrator aircraft leading to an European fighter for the 1990s and beyond'. Note the careful observance of strict English grammar rules and syntax with the use of the emphatic adjective 'an' before 'European'.

Grammar apart, this is good news for BAe and for many aerospace equipment manufacturers who will now be called upon to design and manufacture a great range of equipment for this programme. Apart from the fact that, as a BAe spokesman told us, it will help to fill the gap when the Tornado programme flattens out in the mid-1980s, BAe and its hundreds of sub-contractors to the Tornado programme, need a project to carry them forward from there into the next decade. Not that the EAP is the forerunner; Britain's aerospace industry has already developed and flown several advanced technology demonstrators. The Jaguar with active flying control system has completed its initial flight test programme and is now well into the second phase. In Germany — and we must not overlook the fact that Tornado is the result of a trinational programme — a Tornado has flown with carbon-fibre composite tailerons built by MBB and by BAe. This underlines the fact, if it requires this emphasis, that Europe's next fighter will need to be a collaborative programme if it is to succeed Thus the EAP will incorporate technology evolved by the three companies concerned with the current Tornado programme; BAe, MBB in Germany and AIT in Italy.

Clearly we Brits fervently hope that this same triumvirate will stick together to create and manufacture 'an European fighter for the 1990s and beyond'. There is a major competitor in France — Dassault-Breguet with the ACX —and it is possible that Germany will see a new route to meeting its own fighter needs through collaboration with the French. It seems, therefore, that Germany is the fulcrum on which the next fighter programme pivots. If the seesaw does not come down on the side of the UK/Germany/Italy consortium then there is little chance for the continued survival of the ACA/EAP.

And after all that, your correspondent is still not one hundred per cent sure of the exact definitions of ACA and EAP and their relationship in the context of plans to produce a European fighter for the 1990s and beyond.

(A full report and photographs on the Paris Air Show will be featured next month — Ed.)

Harrier carrier

When Captain Aitor Suso set sail from Oporto bound for Tenerife in the good ship *Alraigo* his last thought would have been that he would be adding to his deck cargo en route. But his ship was in the right place in the Atlantic at the right moment when young Sub-Lieutenant Ian Watson came along in his Harrier with the fuel contents gauges showing 'empty'. A few moments later Harrier and Watson were perched atop some of the containers on the *Alraigo's* foredeck. At the time of writing the almost inevitable wrangle over salvage money is still under way, but this emergency landing could not have come at a better time in the continuing sales campaign for the Harrier!

The Falklands war again focused attention on the potential of a variety of contemporary merchant vessel types in a military role. But this subject has been under discussion for decades and stems from experience in two major wars. Now the decline in numbers of naval vessels and the growth in merchant fleets of the container ship has caused yet another rethink of the merchantman's role in any future role. Already Project Arapaho in the United States has shown that a container ship can be swiftly converted into a fighting ship through the use of packaged defensive armament systems, a flight deck and hangar, night landing aids and damage control equipment — much of it containerised — to produce a vessel which can provide sea lane defence and convoy protection with helicopters or Harriers.

The Harrier concept may be a bit long in the tooth but it's the only one we've got and, happily, it is battle-proven and effective. And no other aircraft available to the Western World could have brought off the type of landing which Ian Watson accomplished in his Harrier on the *Alraigo*.

Red Arrows in North America

Above: The Red Arrows photographed by Sgt Brian Lawrence over Niagara Falls during their three-week tour of service bases in Canada and the US in May. Over 750,000 spectators watched displays by the team and on one day alone, at Andrews AFB near Washington over half a million people visited the Air Day which included the Red Arrows in its programme. The team left RAF Scampton on 3 May and, after staying overnight at Kinloss, flew to Goose Bay and Trenton in Canada via Keflavik in Iceland and Sonderstrom in Greenland. Their tour then took them to Ottawa, Toronto, Niagara Falls and to US forces' bases in Maryland, Virginia, North Carolina, South Carolina, Florida, Texas and Georgia. After their last display at the Bagotville Canadian AFB, in Quebec province, the Red Arrows returned to Scampton on 27 May, again via Greenland and Iceland.

● Twelve RAF Hawk jet trainers will be loaned to the US Navy next year as a lead-in to the introduction of the aircraft as a Navy trainer in 1987.

airnews

ACA given go-ahead

A UK Government contract has been signed with British Aerospace for the development and construction of a technology demonstrator aircraft with a potential application to fighter aircraft for the 1990s. Signing of the contract follows the announcement by the Secretary of State for Defence at Farnborough last year that an Experimental Aircraft Programme (EAP) was to be undertaken jointly by the Ministry of Defence and the UK Aerospace Industry.

The programme is being implemented by BAe Warton Division in conjunction with European industrial partners and will use a prototype of the Agile Combat Aircraft which was also announced at last year's Farnborough show. The aircraft is due to fly in 1986 and will demonstrate the new technologies which aim for maximum performance at minimum cost.

In recent years, BAe and a number of major component and equipment companies — Rolls-Royce, Marconi Avionics, Smiths Industries, Dowty, Ferranti and Lucas Aerospace — have already invested some £25 million of their own money in the ACA and preceding but related programmes such as the P110 project.

Singapore Airlines re-equips

Singapore Airlines (SIA) has embarked on a programme to modernise and revitalise its fleet, with the primary focus on the short-to-medium haul aircraft. SIA will receive six Airbus Industrie A310 aircraft and four Boeing 757 aircraft over a period of six months starting October 1984. These aircraft will serve the regional routes. In addition, for inter-continental services, SIA is buying six Boeing 747-300s in a follow-on order to the eight -300s (SUDs) contracted for in December 1981. The six new SUDs will be received over a period starting in March 1985 and ending in March 1988.

The contracts with the two manufacturers are valued at $1,430 million — $1,010 million with Boeing and $420 million with Airbus Industrie. The agreements with the two manufacturers provide for the trade-in delivery to them of the remaining three DC-10s and 10 A300s now in the SIA fleet or yet to be delivered. In addition, two B747s with JT9D-7Q engines will be returned. The powerplants for the three types of aircraft have not yet been chosen. The principal engine manufacturers, General Electric, Pratt & Whitney and Rolls-Royce will be invited to submit tenders. A choice is expected to be made by the end of July.

Spain orders F-18

The Government of Spain has signed a $3,000 million contract to purchase McDonnell Douglas F/A-18 Hornets, it was confirmed on 31 May 1983. In signing the Letter of Offer and Acceptance from the US, Spain has ordered 72 aircraft with an option for 12 more. The first Spanish F/A-18 is to be delivered in 1986.

As part of the contract, Spain will manufacture F/A-18 components, including parts of the airframe, engine, radar and other avionics. McDonnell Douglas is committed to an industrial benefits programme in Spain valued at $1,800 million. The programme calls for transfer of certain aerospace and other industrial technology to Spain, assistance in foreign investment and export development. The Spanish aircraft industry has been offered manufacture of F/A-18 leading edge extensions; inboard and outboard leading edge flaps; horizontal stabilators; centreline pylons; speed brakes; dorsal covers; rudder assemblies; and side panel assemblies.

The Spanish AF intends to fly the aircraft as a strike fighter with emphasis on the air-to-ground role.

BAe 125 srs 800 revealed

The British Aerospace BAe 125 srs 800, the latest version of the mid-sized business jet, was ceremonially rolled-out from the Company's Chester factory on 1 June 1983 after having made its first flight on 26 May. After the roll-out ceremony the aircraft made a short flight including a low fly-past over the Chester airfield. The chairman of British Aerospace, Sir Austin Pearce, announced at the roll-out that orders had been received from two UK customers. One of these is Goodman Air Taxis, which operates out of London, and the other is an unnamed customer.

The srs 800 is the most radically altered version of the 125 to-date. The principal changes are:

- New Garrett TFE731-5 engines of 4,300lb thrust giving an improved performance over the TFE731-3 version fitted to the 125-700.
- A redesigned, wider span, wing using Airbus and 146 design technology.
- A reshaped rear fuselage giving less drag and more fuel capacity.
- Increased fin area including a suppressed HF aerial.
- A new flightdeck with a wider instrument panel and curved, aerodynamically efficient, windscreen.
- Sequenced nosewheel doors
- A restyled interior giving nearly five inches increased width at shoulder height and a full inch more headroom.
- A redesigned instrument layout incorporating Collins EFIS (Electronic Flight Instrument System). Five cathode ray tubes provide the latest data presentation as fitted to the new generation of airliner.

More Searchwaters ordered

Further orders for versions of Thorn EMI's Searchwater radar have been placed by the UK Ministry of Defence. These latest contracts, worth some £35 million, cover the supply of the standard maritime reconnaissance radar to the RAF and of the new airborne early warning (AEW) version to the Royal Navy.

The RAF order calls for the supply of Searchwater equipment to complete the updating of all its Nimrod maritime reconnaissance aircraft to MR2 status and includes a quantity of spares. The standard radar is currently also being evaluated by the US Department of Defense for use in the Lockheed P-3 Orion maritime reconnaissance aircraft.

The RN order involves the supply of additional AEW Searchwaters to fit Sea King helicopters for the new role of airborne early warning to enhance the self-protection capability of naval forces.

Above: Canada's CF-18 fighter has received initial in-flight refuelling certification following recent trials with a Canadian Forces Boeing CC-137 tanker. The trials at CFB Cold Lake involved two No 410 Squadron CF-18s in a series of one and two point linkups with the tanker, which mounts a Beech probe and drogue refuelling pod on each outer wing panel. The trials were undertaken by day and night at altitudes ranging from 18,000 to 36,000ft.
Photo: Canadian Forces

Wessex for Glos Air

A new charter helicopter service has been inaugurated at Hurn airport, Bournemouth, with the delivery of the first of two Westland Wessex helicopters to Glos Air. The Bournemouth based company is planning to use the two aircraft for both passenger and freight charter, as well as heavy lift operations. The likely initial areas of operations for the helicopters will be for passenger flights to the Channel Islands and the company also plans to have the aircraft available for offshore exploration work.

It is the first time Glos Air has gone into helicopter operations — although its maintenance unit at Hurn does work on them — and future expansion of the service is planned with the delivery of its first Westland 30 early next year. The two Wessex aircraft were refurbished at Westland Helicopters' Weston-super-Mare factory.

First 146 delivered

British Aerospace handed over the first production example of the new 146 feederliner to Dan-Air Services at Hatfield, on 23 May 1983. After the ceremonial handover was complete the 146, under the command of Dan-Air's 146 Fleet Captain, Laurie Buist, flew to the airline's home base at Gatwick Airport, passing low over Central London to demonstrate the low noise level which is a characteristic of the new design.

In accepting the log book of the aircraft Mr Newman, chairman of Dan-Air, described the delivery of the first 146 as a big milestone in the history of the airline — formed on 21 May 1953, with a single Dakota. The BAe 146-100 will be operated in 88-seat configuration by Dan-Air over its scheduled and charter routes. The first scheduled flights will be from Gatwick to the Swiss capital Berne.

● An in-depth study of the BAe 145 feederliner was published in the June and July issues of *Aircraft Illustrated.*

Above right: The first production BAe 146 was handed over to Dan-Air on 23 May and is now in service.

Right: The RAF took delivery of its first BAe 146 on 14 June. Designated BAe 146 C1 by the RAF, its two aircraft will be based at Brize Norton which is one of the two main transport stations in the UK. There they will be operated as medium-range transport aircraft, carrying a variety of personnel within Britain, north-west Europe and the Mediterranean area. During the period up to 1985 the aircraft type will also be evaluated for its suitability to replace the Andovers of the Queen's Flight. If the evaluation shows the 146 to be acceptable it is likely that these -100 versions will be replaced by the longer-range executive versions which will by then be available and it is the longer-range aircraft which would join the Queen's Flight. *Photos: British Aerospace*

airnotes

● **BAe Dynamics Group** has announced the development of the Rapier Laserfire weapon system designed for defence of the mobile field army and vital assets, such as airfields, against low-level air attack. It is a self-contained system which will fit on to any medium-sized truck, and is air portable beneath a medium-lift helicopter. Rapier Laserfire incorporates its own surveillance radar with automatic laser tracking, is armed with four ready to fire missiles, and is operated by two men from a crew cabin. **Bristol Division** has been awarded an initial £2 million contract from the Ministry of Defence, Director General Ships for the provision and fitting out of accommodation containers and helicopter support modules necessary to convert the container ship *Astronomer* into a platform for operating and maintaining naval helicopters. It will then become a Royal Fleet Auxiliary. The US Navy prototype system 'Arapaho' has been leased by the Royal Navy as a basis for the conversion. The equipment comprises a prefabricated helicopter deck, with hangar area and supporting workshops.

● The **Canadian Government** has announced its intention to purchase an extended range version of de Havilland's Dash 7 aircraft for use in an ice reconnaissance role. Expected to be delivered in late-1984, the new aircraft will have an increased fuel capacity from 9,925lb to 17,000lb over the standard Dash 7. Known as the Dash 7R, the new variant will join two Electra aircraft currently performing an ice reconnaissance role surveying sea ice and icebergs to assist shipping and oil drilling operations. The extended range Dash 7R will be used along the Labrador Coast and in the Gulf of St Lawrence.

● A £3 million contract for a new section of taxiway which will enable aircraft operating at Heathrow's new fourth terminal to avoid delays, has been let by **British Airports** to Costain Civil Engineering. Construction of the taxiway and the associated works began in June and will take 18 months. The taxiway extension will give uninterrupted access for aircraft between Terminal 4 and the western end of Heathrow's main southern runway.

● The 1,000th **Ecureuil** helicopter left the production lines of Aérospatiale at Marignane on 3 May 1983. The helicopter, an AS355F, is earmarked for an Australian customer. The Ecureuil line went into production in 1974 and as of May 1983, 1,500 orders have been booked from some 40 countries.

Airliner Orders

Airline	*Aircraft*	*No*	*Ordered*	*Delivery date*
Air BC*	DHC Dash 7	1	26 May 83	(see notes)
AirPac*	BAe146 srs 100	1-f 1-o	26 May 83 26 May 83	c-1984 n.d.
America West*	Boeing 737-300	2	30 May 83	c-1985
Bouraq Indonesian Airlines*	BAe 748	6	2 Jun 83	n.d.
Management Aviation	SA365N Dauphin 2	4	May 83	(see notes)
McAlpine Aviation*	BAe Jetstream 31	2	1 Jun 83	Jun & Sep 83
Pelita*	DHC Dash 7	2	10 May 83	Mar & May 84
Singapore Airlines*	Airbus A310 Boeing 757 Boeing 747-300	6 4 6	31 May 83 31 May 83 31 May 83	c-Oct 84 c-Oct 84 c-Mar 85-Mar 88
Southwest Airlines	Boeing 737-200	1	30 May 83	Jun 84
TDA*	Dornier 228-200	2	27 May 83	1 Dec 83

Airliner Deliveries

Airline	*Aircraft*	*No*	*Delivered*	*Date ordered*
British Midland Airways*	Shorts 360	1	18 May 83	n.d.
Dan-Air*	BAe146-100	1	23 May 83	1982
Egyptair*	Airbus A300B4-200	1	11 Apl 83	4 May 79
Finnair*	DC-9 Super 82	1	29 Apl 83	8 Nov 82
PSA	DC-9 Super 82	1	26 Apl 83	14 Aug 81
Republic Airlines*	DC-9 Super 82	1	26 Apl 83	n.d.
TDA*	Airbus A300B2-200	1	26 Apl 83	8 Feb 79
Trans World Airlines	DC-9 Super 82	2	18 & 27 Apl 83	27 Oct 82

Notes

Airliner Orders

Air BC: The Canadian west coast carrier, whose current fleet includes 14 DHC Twin Otters, will begin Dash 7 operations in the autumn on routes serving Vancouver Island.

AirPac: The Alaskan regional airline will use the 146 on its routes in the Aleutian Islands and thus offer the first non-stop commercial jet service between Anchorage and Dutch Harbour.

America West: New airline, America West, will inaugurate services out of Phoenix on 1 August and will fly to West Coast and Rocky Mountain destinations using three leased 737-200s. The airline becomes the fifth customer for the 737-300, total orders for which now stand at 30 with options for 50.

Bouraq Indonesian Airlines: This latest order, worth $50 million including spares, increases the Bouraq fleet of 748s to 16 aircraft. Founded in 1970, Bouraq is now the largest privately owned airline in Indonesia.

McAlpine Aviation: The two Jetstream 31s will be delivered as 'green' aircraft (unpainted, unfurnished and equipped with ferry avionics only) and McAlpine will complete fitting at its Luton Airport facility to a multi-role, 'quick-change' series of configurations comprising 8-9 seat corporate; 12-14 seat executive shuttle; air ambulance and freigher. McAlpine will use the aircraft on executive charter work and linked to the purchase is the appointment of the company as a designated corporate interior completion centre for the Jetstream 31.

Management Aviation: The first SA365N in the order will be delivered in September, another in October 1983 and the remainder in February and March 1984.

Pelita: The new order, worth $27 million including spares, brings Pelita's Dash 7 fleet to five.

Singapore Airlines: With the announcement of these orders, Singapore Airlines has embarked on a programme to modernise and revitalise its fleet, with the primary focus on the short-to-medium haul aircraft (see news item, this issue for more details).

TDA: (Toa Domestic Airlines). The commuter aircraft will be put into regular service within the Kagoshima district on Japan's South Western Islands.

Airliner Deliveries

British Midland Airways: The aircraft entered BMA service on 23 May flying scheduled routes linking Birmingham and East Midlands with London-Heathrow Airport. BMA is the fourth UK operator to put the 360 into service after Genair, Air Ecosse and Loganair.

Dan-Air: See 'airnews' item, this issue.

Egyptair: The airline's fifth Airbus is registered SU-GAA.

Finnair: The final Super 80 in the three aircraft order reported in *Jan 83*, p9 is s/n 1089.

Republic Airlines: Aircraft is s/n 1041.

TDA: (Toa Domestic Airlines). The eighth Airbus for the carrier is JA-8477.

Trans World Airways: The first two Super 82s under the lease arrangement announced between the airline and McDonnell Douglas in October last year (see *Jan 83*, p9). The aircraft are s/nos 1098 and 1101.

Key:

n.d.=no details, e=early, c=commencing date, f=firm orders, o=options, *=see notes.

XP Express Parcel Systems of Amsterdam, the Netherlands, has taken delivery of a Fokker F-27 Mk 600. The company is specialised in overnight dispatch of documents and small parcels and the F-27 is being used on its Luton to Maastricht route. *Photo: Fokker*

RAF accident reports

Hunter T7, XL583

Date: 1 December 1981. *Parent Airfield:* RAF Brawdy, Dyfed. *Place of Accident:* 1½nm north of RAF Brawdy. *Crew:* Two pilots. *Casualties:* Two pilots major injuries.

Circumstances: Hunter XL583 was flown by two instructors from the Tactical Weapons Unit (TWU). The captain, who occupied the left hand seat, was conducting an annual check on the instructional standard and ability of his colleague, in accordance with the TWU staff continuation training syllabus. This required him to adopt the role of a student and, after a low-level navigation exercise, he flew the aircraft back to the airfield. The intention was that each pilot in turn would practise approaches and landings. The captain joined the airfield visual traffic pattern, selected the undercarriage down and then moved the throttle slightly forward before beginning his final turn towards the runway. The aircraft was 1,000ft high, decelerating through 200kts, with the undercarriage lowering, when both pilots became aware of a low frequency vibration from the engine. They decided to land from the approach but, shortly afterwards, noticed that the engine RPM indication was considerably less than they expected. The captain moved the throttle forward but the RPM did not increase; both pilots realised that the engine power was insufficient to permit the aircraft to reach the runway. The instructor in the right hand seat was given control, while the captain operated the Fuel Pump Isolate Switch (FPIS) which was the only means of overriding the automatic fuel control system. Meanwhile, the undercarriage was selected up to reduce the rate of descent. The engine RPM increased momentarily but quickly decayed again, and ground observers noticed a plume of flame coming from the jet-pipe. By now the aircraft was descending through a height of 250ft; the pilots realised that there was no prospect of recovering the aircraft and ejected, each sustaining spinal injuries. The aircraft crashed in open pastureland and was destroyed.

Cause: An exhaustive investigation revealed that a diaphragm — one of the critical components of the engine control system — had ruptured in flight. An experiment by the manufacturers confirmed that such damage would result in the compressor being choked by air at low RPM, preventing the engine from accelerating normally in response to the throttle. This would have caused the vibration reported by the pilots. Use of the FPIS in these circumstances would have produced a degree of over-fuelling which the engine could not accept, resulting in flame from the jet-pipe and overheat damage to the turbine. Such damage was evident from an examination of the engine, and this would have caused the subsequent decay of RPM. It was determined that the ruptured diaphragm was the primary cause of the accident, and that in the circumstances the crew could have done nothing to prevent the loss of the aircraft. Use of the FPIS was judged to have been reasonable, since the only other option available to the crew was immediate abandonment.

Subsequent actions: An improved diaphragm material has been developed and tested. This has been used in the manufacture of the appropriate components which have now been fitted to all in-use engines of the type installed in XL583. Component quality control, assembly and testing arrangements have been revised and the performance of the new diaphragms will continue to be regularly monitored until the requisite degree of confidence has been assured by service use.

Bulldog T1, XX662

Date: 20 February 1982. *Parent Airfield:* RAF Leuchars, Fife. *Place of Accident:* 6 miles south of Leuchars. *Crew:* Two pilots. *Casualties:* One (slight).

Circumstances: On the morning of 20 February 1982 the Squadron Commander and a Qualified Flying Instructor (QFI) from a University Air Squadron (UAS) took off in Bulldog XX662 on a staff continuating training (SCT) sortie that was to include high rotational spinning practice. The weather was ideal for the exercise with no cloud cover, a good horizon and good visibility. The QFI, in the right hand seat, entered a high rotational spin to the right and recovered normally, using the standard recovery drill. The Squadron Commander then took control and climbed the aircraft back up to Flight Level (FL) 100 for a further high rotational spin. He completed the pre-spinning checks for the second time and rebriefed the technique he would use and drills to be followed by each pilot in the event of an abandonment. The aircraft entered a normal spin to the left cleanly and, after about three turns and with the aircraft's nose about 70° below the horizon, the Squadron Commander initiated a high rotational spin by applying full right (anti-spin) rudder and moving the control column 1½in forward from the fully aft position. The speed of rotation increased and after about two turns the Squadron Commander moved the control column fully forward while maintaining full right rudder (the standard recovery tehcnique for the Bulldog) and confirmed the direction of spin by reference to the turn needle. After a further 2½ turns both pilots noticed that the spin characteristics had changed; the nose had risen to an estimated 30° to 40° below the horizon, there was considerable yaw, little roll and almost no buffet or oscillation. As the aircraft approached FL 65, having completed an estimated 12 turns with anti-spin control applied, the pilots confirmed that correct recovery action was being taken and attempted to rock the aircraft out of its stable condition by use of elevator; this was unsuccessful and at FL 40 the Squadron Commander ordered abandonment. Both pilots successfully left the aircraft and landed safely although the QFI sustained a broken nose. The aircraft continued to spin until it crashed in open ground.

Cause: During the recovery from the high rotational spin XX662 assumed a spin whose characteristics differed from the description of high rotational spins contained in the Aircrew Manual and from any spin encountered in the extensive spin trials previously carried out in the Bulldog. The pitch attitude was shallower than normal, there was an increase in yaw and an absence of roll. Despite applying the recommended recovery action the aircraft did not recover from the spin. Evidence was found that the bolts securing the elevator operating lever and control torque tubes were loose, but the slight asymmetry resulting from this would not have materially altered the spin recovery capability of the aircraft. The Board therefore dismissed this evidence as a contributory cause of the accident. The Board found that the spin characteristics were outside the knowledge and experience of both pilots who persevered with normal recovery action for longer than required and who cannot be criticised for the loss of the aircraft.

Comment: High rotational spinning, like spinning in general, is an essential handling exercise for all Bulldog QFIs. The Bulldog exhibits both normal and high rotational spin characteristics which must be practiced by QFIs. This is in order to familiarise them with the aircraft handling and enable them to deal with the ever present likelihood of a high rotational spin entered inadvertently by an inexperienced student. The investigation into the accident was unable to establish precisely what caused the particular characteristic of this spin, which was unusually flat, or why the aircraft failed to respond to the standard recovery action. It was an isolated occurrence in the tens of thousands of spins completed by Bulldog aircraft since their introduction into RAF training in 1973.

Hunter FGA9, XE649

Date: 13 May 1982. *Parent Airfield:* RAF Brawdy. *Place of Accident:* 15 miles SE Aberystwyth. *Crew:* One pilot. *Casualties:* One (pilot) major injuries.

Circumstances: The pilot of XE649, an instructor at the Tactical Weapons Unit (TWU), was flying as the leader of a section of four single-seat Hunters on a low-level simulated attack mission. A unit based Hawk aircraft was used to pose an air threat, with the aim of forcing the section to take evasive action. All pilots were drawn from the TWU staff and the sortie was flown in accordance with the Staff Continuation Training syllabus. The flight went according to plan until the Hunters were re-grouping after carrying out individual simulated attacks on their first target; at this stage the Hawk closed in behind the No 4 Hunter. When the aircraft was seen by the formation, an evading turn was ordered during which the Hawk climbed clear. In the course of the turn, the lead Hunter pilot ordered the formation to roll out on a specified heading. As he rolled his aircraft's wing level, he was aware of two loud bangs and a loss of engine power. He attempted to initiate a climb, but the movement of the control column felt 'gritty' and the aircraft did not respond. He realised that he could do nothing to prevent the aircraft from hitting the ground within seconds and he therefore ejected. Simultaneously, the No 3 pilot saw a plume of flame emerge from the jet pipe of the lead aircraft and called his leader to pull up. The aircraft crashed into an area of boggy moorland and disintegrated on impact. The pilot landed in close proximity to the wreckage and had to roll clear of a residual ground fire. He sustained spinal injuries.

Cause: Examination of the wreckage proved conclusively that an in-flight turbine failure had occurred. A segment of the fractured turbine disc had broken through the engine casing and had then penetrated the fuselage structure. The reason for the loss of elevator control could not be positively established but it was concluded that the catastrophic engine failure had probably caused some distortion of the fuselage and produced a nose down change of trim. Metal fatigue was believed to have been the cause of the turbine failure, and this had probably been induced by variations in gas pressure around the circumference of the turbine entry nozzle area.

Subsequent Actions: The Service engineering authority, in collaboration with the manufacturer, has isolated those Hunter engines which were considered to be at risk from similar failures. These engines have been categorised either for rejection or for monitoring to detect incipient failures. In addition, the manufacturer has introduced revised engine overhaul acceptance standards, which require adjustment of the gas flow pressure distribution in order to eliminate alternating stresses in the turbine disc.

airbooks

ABC British Airports (second edition) *by Alan J. Wright, published by Ian Allan Ltd (80pp illustrated text) at* ***£1.75***

This useful pocket guide to the UK's principal airports is a revision of the booklet first published three years ago. It details the location, history, access, operators, radio frequencies and other information for 43 air terminals from the Isles of Scilly to Wick. New maps have been provided, courtesy of the CAA and detailed attention has been paid to providing information about spectator facilities, both within the airport and on the perimeter.

The author has thoroughly researched the subject by visiting each of the airports and checking out the facilities and has also looked at the public transport access. A scrutiny of timetables has produced a list of airlines and operators likely to be seen at the airports, but inevitably with a constantly changing scene this is somewhat historical.

In addition to the main airports an airfields guide section provides brief details of civil and military airfields which, in the main, do not receive scheduled airline services. The many private airstrips are not listed.

British Airports is an invaluable guide for the spotter and airport visitor, particularly anyone intending to travel away from their own locality or tour an unfamiliar region. It should not, however, be used by pilots except as a general guide. **PRM**

The New Observer's Book of Airliners *by William Green and Gordon Swanborough, published by Frederick Warne Ltd (192pp illus text) at* ***£1.95***

This edition is the first to appear in the revised format of the 'New Observer's Book' series and looks as though it will prove as useful as its predecessors. There are colour photographs, silhouettes and data for 90 types of commercial airliner including some such as the BAe ATP and the Saab-Fairchild 340 which have yet to enter service and do, in fact, represent a new range of short to medium range machines. **JFP**

De Havilland Heron *by J. Graham Cowell, published by the author (184pp illus text) at* ***£7.50*** *plus* ***95p*** *p&p**

The success of the de Havilland Dove in the early postwar years led to the development of the larger four-engined version which was to be known as the Heron. Designed for economy and simplicity of maintenance it began with a fixed undercarriage with that factor particularly in mind. Later it was found that the saving in fuel because of lower drag more than balanced the weight of the retraction gear and some two-thirds of the 148 Herons built were of the Srs 2 versions with retractable undercarriage. Re-engining has resulted in the retention of nearly half that output in service up to the present time mostly in America and this 184-page book with copious illustrations brings the situation up to date in a most adequate fashion. **JFP**

*Available from 26 Alford Court, Bonchurch Close, Sutton, Surrey SM2 6AY.

Vintage Aircraft of the World *by Gordon Riley, published by Ian Allan Ltd (192pp illus) at* ***£7.95***

This is a comprehensive survey of vintage aircraft types preserved around the world. Author Gordon Riley, editor of the quarterly *Vintage Aircraft* magazine, has drawn upon his extensive knowledge and enthusiasm for the subject to produce a very thorough reference book. He limits the subjects included to machines built between 1903 and 1945, dividing them into four Parts 1903-13, 1914-18, 1919-38 and 1939-45 and in the introduction qualifies entries to types that are normally on public view.

Throughout the book each type is illustrated by a photograph of an example preserved, although in one or two instances the aircraft shown, such as the A-26 Invader, has since been destroyed. Technical information is followed by a brief history of the type and reference to where examples can be seen today, repeating the pattern established in the earlier publication *Preserved Aircraft*.

Vintage Aircraft of the World concludes with an index of types listed. It would have been helpful to the reader who hopes to follow up some of the references provided, if a list of the principal museums mentioned in the text could also have been added, together with a brief note about location. Notwithstanding this omission the book is a very welcome addition to the growing library of publications which chronicle the aviation scene both past and present. **PRM**

1000 Up — a production history of the Pilatus Britten-Norman Islander, Trislander and Defender *by A. B. Clancey and A. J. Wright, published by BN Historians (216pp illus text) at* ***£6.50*** *(softback),* ***£8.95*** *(hardback)*

This book follows 'The First 500' and '12 Years On' by the same authors which dealt with the earlier years of the Britten-Norman partnership and tends unavoidably to repeat quite a lot of their contents. Much has been added, however, and the frequency with which aircraft of these sizes tend to change hands means that some are recorded with as many as 10 different owners. There are 24 colour and some 50 black and white illustrations as well as a full production list of 1,100 aircraft. **JFP**

The de Havilland Canada Story *by Fred W. Hotson, published by CANAV Books (244pp illus text) at* ***$29.85***

It must be admitted that this is not a cheap book but it certainly embodies a good deal of material with 350 black and white photographs, 40 photos and 20 profiles in colour and a plethora of exploded views, diagrams, technical drawings, maps and charts. The text is most readable and takes in a substantial amount of Canadian aviation history apart from de Havilland Canada itself. It recalls for example the mishap experienced by the Imperial Airways flying-boat *Cambria* at Toronto. It begins with the Moth and concludes with the Dash 8 — quite a span when one considers what lies between! **JFP**

B-24 Liberator at War *by Roger Freeman, published by Ian Allan Ltd (128pp illus text) at* ***£8.95*** *and* ***B-25 Mitchell at War*** *by Jerry Scutts, published by Ian Allan Ltd (144pp illus text) at* ***£9.95***

Two new titles in the 'at War' series from Ian Allan have at last shed more than a superficial light on the operations of the B-24 Liberator and the B-25 Mitchell — perhaps the most underrated aircraft of the whole WW2 period. Roger Freeman's examination of the Liberator's war record takes a brief look at the type's flying-boat ancestry, includes the fascinating memoirs of a desperately overworked crew chief, and goes some way to explaining the multiplicity of nose and tail configurations caused by armament and equipment changes. The most striking parts of the story are individual recollections from every member of a Liberator crew — each descriptive essay bringing the Liberator to life as a troublesome but strangely lovable partner in the intensely human business of waging war.

The B-25 Mitchell story by Jerry Scutts is very much in the same mould, and is beautifully illustrated with some stunning photographs of the low-level exploits of these daring raiders. Much of the book is given over to the wide variety of armament applied to the basic Mitchell airframe, including a totally absorbing chapter on the application and use of the 75mm M-4 cannon — basically a 1,400lb army fieldgun with an aircraft wrapped around it to achieve an awesome degree of aerial fire power. **PG**

Say Again *by Martin Leeuwis and Ton van Andel, published by Martin Leeuwis (144pp illustrated) at* ***£7.50*** *incl p&p**

Say again is a unique collection of aviation cartoons and NATO 'bar talk' assembled by two Dutchmen, Ton van Andel, who did the drawings and Martin Leeuwis who edited the text. Both have completed long service with the Royal Netherlands Air Force which has brought them into contact with the zany humour of aircrew from across Europe. Many of the comic situations have been with us for years but the authors have given a novel twist to old ideas. There are, for example, four derivations for the notorious Murphy's Law and if you want alternatives to 'Fighter Pilots do it better' there is a list of 40 more including the reviewer's favourites 'Aerobatic pilots do it inverted' and 'Without ECM nobody does it'.

Each cartoon, on right-hand pages, is captioned in English, with jokes and sayings on left-hand pages, also in English. Included among the latter are 20 'snappy answers' like 'Tower: You have traffic at 10 o'clock six miles. Pilot: Give us another hint; we have digital watches'. This lighthearted look at aviation should be on every pilots' and enthusiasts' book-shelf to bring welcome relief from the countless pages of technical and professional literature. After reading *Say again* you won't view the F-16 in the same way ever again. **PRM**

*Available from Martin Leeuwis, PO Box 234, 3370 AE Giessendam, Holland.

airkits

James Goulding

The ultimate 707 . . .

Nitto has produced an ever-improving range of airliners in 1:100 scale. Although 1:100 is not one of the more popular scales there are sufficient kits available to build up a nice collection. Many of the famous airliners are in the Nitto range and there are other 1:100 scale kits, in lower quality, in the Plasticard series and, when available, from Tamiya. There also are a few in the Heller Cadet range.

A splendid kit in the Nitto range is boxed under the label 'Boeing E-3A AWACS', but which in reality is a universal Boeing 707 kit. This I regard as the ultimate Boeing 707 kit, because not only is it of superb quality, but it gives parts to enable the modeller to produce a standard 707-320 airliner or freighter, a KC-135E or the E-3A AWACS.

The fuselage halves have punched out windows and there are transparent windows in strips for use on the civil variants. The KC-135E and E-3A Sentry models have very few windows and strips of opaque plastic window plugs are provided to blank out the windows on these versions. The port (left hand) fuselage half has the large opening for the cargo loading door which is used on the KC-135 and on civil 707 freighters. The large door is included in the kit, thus enabling modellers to produce a civil freighter as well as the KC-135E. A short section of cabin flooring, with bulkheads, is included for use with the freight door, and here a freight load could be shown and the door cemented open.

On the same fuselage half the front part has thinned areas, so that a section can easily be cut away and a special transparent section provided in the kit can be let in to show the cockpit interior detail, which is good. Even the nose radar scanner is included.

Another innovation is the inclusion in the kit of alternative, transparent engine nacelles under the port wing to show the detailed engines.

A number of components, such as the cockpit fittings, engines, cabin floor and bulkheads, instrument panels, undercarriage bays, and tyres, are moulded in black plastic. The frame with all the transparent components — window strips, engine pylons and nacelles, forward fuselage section and pilot's windscreen and side windows — is repeated in opaque silver plastic, this presumably being a cheaper way of providing the blank window plugs than moulding separate window strips. The modeller is thus left with two additional nacelles and other redundant components.

The general shape and moulding of this Boeing 707 model is excellent, with very good attention to the subtle contours of the fuselage and the changes of the wing aerofoil sections and incidence along the span. Surface detail is nicely engraved and consists of indented skin lines and panels. The wings and tailplanes have angled vortex generators. Well-detailed undercarriage legs look very authentic and the wheels have separate black tyres.

The rigid refuelling boom and fairing are included for the KC-135E variant but, of course, the most spectacular version is the AWACS E-3A Sentry, with its huge, flattened scanner housing on its mounting on the aft upper fuselage.

Markings are only given for the E-3A in USAF service, but those operating in Europe have NATO markings. This is a fine kit, which gives the modeller a good choice of Boeing 707 subjects — although only the E-3A markings are provided. Markings for other variants would have to be made up, but the 'US Air Force' lettering and national markings, can be used on the KC-135E. Nitto also issues this model in the markings of 'Air Force One', the Presidential aircraft.

Our sample kit was kindly supplied by Toyway, the distributors for Nitto in the UK. The kit costs £11.75.

. . . and a fine DC-9

Another splendid model in the Nitto 1:100 scale range is the McDonnell Douglas DC-9 series 41. This is a stretched development of the famous twin-jet.

The DC-9 srs 10 always looked rather short and portly, but was otherwise an attractive aircraft, but the lengthened fuselage of the series 40 improved the appearance. The new Super 80 has rather gone to extremes and looks too long. The aesthetic appeal of the DC-9 srs 40 is well shown by Nitto's attractive model, which has a very good outline shape. The model is beautifully moulded and the fit of parts is such that little filling of joints is necessary. Surface engraving is superb, with clean, indented panel and skin line detail.

After the highly detailed Boeing 707 cockpit, it is a little disappointing that there is no detail in the DC-9 cockpit. Even a floor and bulkhead would have been useful, but these are fairly easy to add. Of course, it is arguable that very little of the Boeing 707 cockpit can be seen unless one cuts away the forward part of the fuselage and substitutes the special transparent component, and a similar provision has not been made in Nitto's DC-9. Painting the entire interior in a dark shade does improve the appearance and hides the lack of cockpit detail.

The DC-9 srs 40 series markings in the kit portray the attractive green and red colour scheme of the Japanese airline TDA. Our sample of the Nitto DC-9 srs 41 kit was kindly supplied by Toyway. It costs £5.75.

Other Nitto kits in 1:100 scale, some of which I hope to review in due course, are the Boeing 747, Boeing 737, Boeing 727-200, TriStar, Douglas DC-10, Douglas DC-8 srs 62, Concorde and Douglas C-47.

Revell re-releases

At the Toy Fair at Earl's Court it was difficult to understand the thinking behind the Revell decision to re-release the early 1:96 scale kits of the Avro Vulcan B1 and Handley Page Victor B1. Can these kits really have been intended to counter the new Airfix Avro Vulcan B2 and Matchbox Handley Page Victor B (K) 2? Surely not! Yet, the company has also re-released an OV-10B Bronco — a type that has not been much in the public eye since the Vietnam War, but which this year is included in Airfix's programme of revised kits. A coincidence perhaps?

The Bronco kit is in 1:72 scale and is still welcome as a good model of the OV-10B, but there does not seem to be any point in re-issuing kits of dubious accuracy in a scale which is now almost extinct. There was a time when several companies produced models in 1:96 scale, notably Frog in the early days, Lindberg, Hawk and some companies that fell by the wayside. Eventually, the popular scales settled down to three sizes — 1:144th scale, 1:72 scale and 1:32 scale. 1:48 scale had been popular before the war and a few kits were available at this time. Suddenly there was a welcome resurgence of 1:48 models and now there are many kits available in this scale. As stated elsewhere, the metric 1:100 scale has also had considerable backing, but 1:96 scale has largely faded from the modelling scene and no new kits in this scale have been produced for many years.

The Avro Vulcan model is inaccurate in general and it represents the big delta-wing bomber in its early form, with a pure triangle-shaped wing. The outer wing of the Mk1 was soon modified to incorporate conical camber. These modifications involved an extension forward of the leading edge, with increased sweepback on the outer panels and merged back on the inboard part of the existing leading edge line. These leading edge extensions of the wing have considerable local camber. This modification was soon introduced on the Mk1s and was further developed on the Mk2.

The markings supplied are for a prototype, VX777, but to my knowledge this aircraft never carried the V-bomber low-altitude camouflage scheme of Medium Sea Grey and Dark Green, as shown on the box and on the instruction leaflet.

The wing on the model is awful and totally lacking the correct appearance of the real aircraft. The Vulcan wing, when viewed head-on, tapers down fairly sharply over the engine bays and then has a straight taper to the thin tips. The wing section has maximum thickness well back from the leading edge and the contours are not blunt, unlike the model, which has maximum thickness at about 20% back from the leading edge. The resulting wing is thick and clumsy.

The Victor model is much more acceptable than the Vulcan, while still having considerable shortcomings. In general shape it is more accurate than the Vulcan, but again, owing to the age of the moulding tool, this model seems to have been based on drawings made from photographs before any accurate information had been released to the public. The wing planform seems to be fairly accurate, but the wings are too thick towards the tips and do not have the characteristic decrease in incidence over the outer panels. The engine intakes are too narrow in depth and can be improved in appearance by cutting away the upper and lower lips to give more area. Four separate engines are supplied which are cemented into the bays in the wings and they can be seen through the engine bay door openings in the top of the wings.

This model represents the Victor B1 in its production form, but for some reason the decal sheet gives markings for the second prototype — which differed from the production aircraft in many ways, notably in having a taller fin of different shape. This prototype was never camouflaged in the low-altitude scheme and was at one stage painted in black and silver, with a red cheat line. Possibly the old decal sheet from the original kit has been re-printed, which dates the kit to when the Victor prototypes were flying!

Revell has re-issued the old OV-10A Bronco kit as a OV-10B target towing version. This has a transparent rear fuselage and large ventral tank. This was always a good kit of the Bronco and this Federal German *Luftwaffe* variant is a welcome addition to our collections.

The 'Falklands factor' has extended to our hobby, with a number of kits being updated with either physical or markings changes to reflect the Falklands campaign. Revell's 1:32 scale Mirage IIIE model now has the addition of Argentine markings, and it appears in this guise on the box top photograph. French, Swiss and Spanish markings are also included. This is, of course, a superb model of this fine French fighter-bomber and an example of Revell kit production at its best. Revell over the years has given us some magnificent models and I do feel that they should be very selective about re-issues of old kits, particularly those which originated elsewhere and not in the Revell design department. I have great respect for the company's ability, borne of experience of reviewing their kits over many years, but re-issues like the Victor and Vulcan do nothing for their reputation, especially when these have to compete against 1:72 scale kits of the latest variants of these famous aircraft produced to modern high standards.

The Victor and Vulcan cost £4.99 each, the OV-10B Bronco costs £2.55 and the Mirage IIIE costs £8.10.

airregister

Compiled by **A. J. Wright**

THE Beech 18 was formally a C-45H, one of several hundred reworked for the USAF in 1951-52. It appeared at the Duxford auction earlier this year but was then unsold. It seems rather a strange move to register the Lockheed 10 unless it is proposed to keep it airworthy at Wroughton, where it has been since its delivery last year. British Airways has now decided to take delivery of the stored 747 G-BDXK, while its smaller relative has gone to Dan-Air from Arkia. The first two BAe 125 srs 800s appear this month, no doubt with many to follow in the future. Pacer G-PAXX acquired these marks on 20 May having quickly shed the vintage registration specially selected on 28 April. It is hardly likely that it was ever carried.

Registration	*Type*	*C/n*	*Owner or operator*
G-BDXK	Boeing 747-236B	22303	British Airways
G-BKNH	Boeing 737-210	21820	Dan-Air Services Ltd (4X-BAA)
G-BKRG	Beech 18	—	Aerotech Ltd (N75WB)
G-BKRL	Designability Leopard	001	Chichester-Miles Consultants Ltd
G-BKSH	Colt 21A balloon	510	Grenham Trading Ltd
G-BKSU	Short SD3-30	SH3095	Short Bros Ltd
G-BKSV	Short SD3-30	SH3096	Short Bros Ltd
G-BKSX	Stampe SV-4C	61	W. Norman (F-BBAF)
G-BKSZ	Cessna P210N	00818	Northair Aviation Ltd
G-BKTA	PA-18 Super Cub 95	18-3223	ISI Sales & Marketing Ltd (OO-HBA/OL-L149/53-4823)
G-BKTC	Pitts S-2E Special	09-10846	E. B. Bray
G-BKTD	Partenavia P68C	297	Alvair Aircraft Sales Ltd
G-BKTE	Colt AS-105 balloon	490	Colt Balloons Ltd
G-BKTF	BAe 125 srs 800A	258001	British Aerospace Plc Aircraft Group
G-BKTG	Enstrom F280 Shark	1015	Southern Air Ltd (OY-HBP)
G-DCCC	BAe 125 srs 800B	258002	British Aerospace Plc Aircraft Group
G-FDGM	Beech B60 Duke	P-285	Fisher & Donaldson (G-BFEZ/ ZS-RHS/N7340R)
G-JLCO	AS355F Twin Squirrel	5262	John Laing Construction Ltd
G-LIOA	Lockheed 10A	1037	The Science Museum (N5171N)
G-MJTL	Aerostructure Pipistrelle 2B	018	Southdown Aeroservices Ltd
G-MJTM	Aerostructure Pipistrelle 2B	019	Southdown Aeroservices Ltd
G-MJTR	Southdown Puma DS Mk 1	H362	V. E. J. Smith
G-MJTW	Eurowing Trike	EWT004	B. K. Harrison
G-MJTY	Huntair Pathfinder	CHS-01	C. H. Smith
G-MJUA	MBA Super Tiger Cub	MW-01	M. Ward
G-MJUB	MBA Tiger Cub 440	F043	C. C. Butt
G-MJUC	MBA Tiger Cub 440	RRH-01	R. R. Hawkes
G-MJUD	Southdown Puma	80-00071	North of England Microlight School
G-MJUE	Southdown Puma	82-00435	J. P. Nicklin
G-MJUF	MBA Super Tiger Cub 440	MCT-01	M. P. Chetwyn-Talbot
G-MJUG	Huntair Pathfinder II	HL-01	Huntair Ltd
G-MJUH	MBA Tiger Cub 440	JEJ-01	J. E. Johnes
G-MJUI	Flexiform Striker	BB-01	L. M. R. E. Bailey
G-MJUJ	Eipper Quicksilver MX II	1025	Microlight Airsport Services Ltd
G-MJUK	Eipper Quicksilver MX II	1040	Microlight Airsport Services Ltd
G-MJUL	Southdown Puma Sprint	F512S	K. T. Vinning
G-MJUM	Flexiform Striker	82-00493	A. P. Smith
G-MJUN	Hiway Skytrike	OB17D	A. Donohue
G-MJUO	Eipper Quicksilver MX II	104C	Border Aviation Ltd
G-MJUP	Weedhopper B	775	R. A. P. Cox
G-MJUR	Skyrider Airsports Phantom	SF-108	J. Hannibal
G-MJUS	MBA Tiger Cub 440	SO-140	H. Jenks
G-MJUU	Eurowing Goldwing	EW-70	B. A. Akiens
G-MJUY	Eurowing Goldwing	EW-82	J. E. M. Barnatt-Millns
G-MMDB	La Mouette Atlas	DB-01	D. L. Bowtell
G-MMUM	MBA Tiger Cub 440	NCB-01	N.C. Butcher
G-MSFY	BAe 125 srs 700B	257200	Mohammad Said Fakhry
G-PAXX	PA-20 Pacer 135	20-1107	D. W. & M. R. Grace (G-ARCE/F-BLLA/CN-TDJ/ F-DADR)
G-TIGS	AS332L Super Puma	2086	Bristow Helicopters Ltd
G-TIGT	AS332L Super Puma	2078	Bristow Helicopters Ltd

airview

Peter R. March

ETPS 40th Anniversary

There was a nostalgic gathering of test pilots, engineers, families and friends of the Empire Test Pilots School (ETPS) at Boscombe Down on Saturday 11 June, to mark the 40th anniversary of the School's formation. The ETPS trains pilots and engineers for exacting roles in flight test teams concerned with the research, development and acceptance of Service aircraft and weapons systems. It was formed at Boscombe Down, Wiltshire, in 1943 under the aegis of the Aeroplane and Armament Establishment. Its terms of reference were 'to provide suitably trained pilots for test flying duties in Aeronautical Research and Development Establishments within the Service and the Industry'. At the time and for several years after, the School was the only institution of its kind in the world.

The first Commandant was Wing Commander (now Group Captain (Retd)) S. Wroath who, together with Mr Maclaren Humphreys as Technical Instructor, ran the first course between them. Group Captain J. F. X. McKenna followed Wing Commander Wroath as Commandant in 1944 when the status of the School was upgraded and it was renamed the Empire Test Pilots School. A few months later the School and the Service suffered a great loss when Group Captain McKenna was killed as a result of a structural failure of the wing while flight testing a Mustang IV. His memory is perpetuated by the McKenna Trophy which is now awarded annually to the most outstanding student of each course.

In October 1945, the School moved to Royal Air Force Cranfield owing to the rapid growth of A&AEE and the resulting shortage of accommodation at Boscombe Down. A further move in 1947 to Farnborough began the long association with the Royal Aircraft Establishment. In December 1949 the School was presented with its Armorial Bearings and a Presentation Parade in Horse Guards Parade, London, was addressed by Marshal of the Royal Air Force Lord Tedder.

Above: A line-up of ETPS aircraft in Hangar 1 at Boscombe Down on 11 June.
Photo: Peter R. March

In 1963 the syllabus of the School was expanded to include a rotary wing course. Hitherto it had been the practice to convert, as required, a number of fixed wing graduates to rotary wing flying and to employ them as helicopter test pilots. Under this system the newly qualified rotary wing pilot arrived at the test establishment with negligible helicopter experience and, once again, the establishment was faced with the problem of expending time and effort on training the new arrival to the required standard. Candidates for the Rotary Wing Course are required to be experienced operational helicopter pilots thus, who on completion of the Course, are able to begin productive work almost immediately. The Course is now firmly established with its own syllabus and aircraft fleet, although the necessary integration with its Fixed Wing counterpart is assured by common attendance at most lectures, the use of common facilities and, of course, socially.

Farnborough became increasingly built up and the difficulties of operating the high performance aircraft of the fleet on a restricted runway more evident. In addition the growth of the London Terminal Control Area, together with the established airways to the north and south, mean a progressively limited airspace for flying exercises. A move became inevitable and the

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Above: Jet Provost T5A, XW365/73, of 1FTS seen over North Yorkshire during a training sortie from RAF Linton-on-Ouse.
All photos by the author

1 Flying Training School, RAF

Robin Sinton *visits RAF Linton-on-Ouse to look at the training role of No 1 Flying Training School*

'THE RAF, in common with all the major air forces in the world, is now a low-level force. With nearly 400 Tornado aircraft entering service with the RAF over the next 3 to 4 years we are thinking in terms of speeds in excess of 600kts at 100ft from the ground in a very hostile environment. In addition to this, many transport pilots, who previously were thought to be basically medium- to high-level operators have now realised that they too must fly at very low levels at times, in order to survive. It requires a special sort of pilot to fly under these circumstances and it is our job at 1 FTS to train and supply pilots for these increasingly demanding roles.' These words were spoken by Wg Cdr Ed Jarron, CO Flying Training Wing at No 1 Flying Training School (FTS) RAF Linton-on-Ouse, and were to be echoed repeatedly by the many instructors that the author spoke to during a recent visit to the school in order to see some of the RAF's training activities.

No 1 FTS has been training pilots for the RAF and the Royal Navy for some 63 years. It was formed in July 1919 as the Netheravon School of Flying but was re-titled No 1 Flying Training School in December of the same year. From its formation until 1924 the school was engaged in training RAF students and some officers from foreign air forces. Basic instruction was carried out in Avro 504Ks continuing to advanced training in Bristol Fighters and DH9As. The courses lasted some 12 months and students flew about 150hr which incorporated instruction based upon many hard lessons learnt during WW1.

Royal Navy and later Royal Marines pilots were nominated to receive their training with 1 FTS during the period from 1924 to 1928 after which it was decided that Fleet Air Arm pilots would receive their instruction at RAF Leuchars. With the new feeling of general disarmament, 1 FTS was disbanded in 1931, only to be re-formed at RAF Leuchars in 1935. It resumed its former role with the Hawker Hart taking over as the main training aircraft. In August 1938 the School moved back to Netheravon and, shortly before the start of WW2, the Harvard was introduced as the intermediate trainer with Harts, Hinds and Fairey Battles used for the advanced courses. At this time the Navy still provided the majority of students under training.

Owing to the unwelcome attention of the *Luftwaffe* in continued harassing raids over Southern England, the School moved to India until the cessation of hostilities, the RAF instructors also training Indian AF pilots. After the end of WW2 No 1 FTS moved back to England and re-opened at RAF Spitalgate in June 1947. The aircraft in use were Tiger Moths and Harvards and the tradition of offering instruction to pilots of foreign air forces continued with the arrival of cadets from the RNethAF.

After a series of moves, disbandments and re-formings, the School made its final move in 1957 to RAF Linton-on-Ouse (where it has remained for 25 years). At that time the basic training aircraft was the Piston Provost, and after graduating from Linton, students were posted to RAF Valley to continue their advanced training in the Vampire. In 1960 the Piston Provost was replaced by the Jet Provost T3 and later the T4, T3A and T5A. At the end of July 1969 the last Royal Navy pilot received his wings at No 1 FTS and the School returned to the task of basic training for only RAF and Foreign and Commonwealth Air Force pilots.

In order to become an RAF pilot it is first necessary for the candidate to convince the

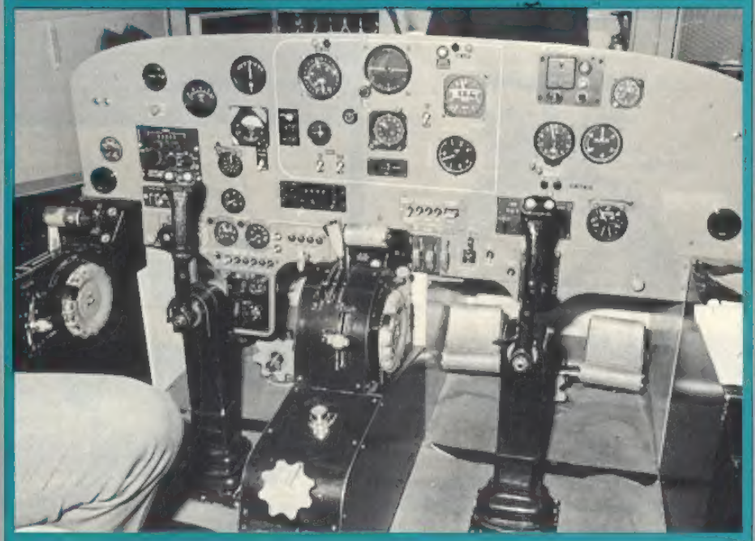
Officer and Aircrew Selection Centre at Biggin Hill that not only is he medically fit but also that he has potentially the necessary qualities that are required of an RAF Officer; all pilots now are commissioned officers. If selected, the aircrew officer cadet will receive his Initial Officer Training at the RAF College Cranwell, an intensive 18 week course which will introduce him to military discipline, drill, weapons training, leadership training and other not so obvious areas of instruction such as service writing and office administration.

After his graduation and commissioning, the first contact that a junior officer has with aviation as a pilot is the Flying Selection Squadron at RAF Swinderby where the successful completion of a 14hr assessment course is mandatory before starting basic flying training. A pilot will be exempted from this course if he holds a PPL or a Silver C gliding certificate, or if he has done previous flying with a University Air Squadron. Having completed this initial stage he is then posted to basic flying training at one of three basic flying training schools, RAF College Cranwell, RAF Church Fenton and RAF Linton-on-Ouse.

Linton-on-Ouse was built as a bomber airfield in the mid-1930s, becoming operational in 1937. At the outbreak of war the aircraft stationed at Linton were Whitleys of Nos 51 and 58 Squadrons. In 1941 the Whitleys were replaced by Halifax bombers and in turn these were replaced by Lancasters when, in 1943, the station was in the hands of the Royal Canadian Air Force with two Squadrons Nos 408 and 426. At the end of the war Linton-on-Ouse again became a base for the RAF this time equipped with fighter aircraft. No 264 Squadron was the first to arrive with Mosquito night fighters to be followed by Nos 64 and 65 Squadrons flying Hornets. In 1950 the jet age came to Linton with the arrival of Meteor fighters of Nos 66 and 92 Squadrons which were subsequently equipped with Sabres and Hunters.

The station is located in the Vale of York — about eight miles north of the City of York — an area which is much used by the RAF for basic training purposes. It has two main runways 04/22 which is 6,000ft in length and a shorter alternative in 10/28 at 4,400ft. As befits an intensive activity area Linton has its own area and precision approach radars and also works closely with the nearby airfields at Church Fenton and Leeming. Elvington airfield to the southeast of York is used as a relief landing ground by Linton-on-Ouse in order to spread the training load and to provide experience for students in landings away from their home base.

Before arriving at Linton to start flying training, the student is given a short aeromedical course at RAF North Luffenham where he is introduced to the demands that modern flight makes upon the human body, he learns to identify the effects of the lack of oxygen, is briefed on the oxygen system in the Jet Provost T3, experiences decompression, and finally is issued with his personal 'Bonedome' helmet and oxygen equipment.



Top: This Piston Provost XF545 was used during the early years of 1FTS' stay at Linton-on-Ouse as a basic trainer until the advent of the Jet Provost. This particular aircraft, photographed during the 25th anniversary celebrations of 1FTS, is normally a 'gate guardian' at Linton.

Above: This simplified JP cockpit is part of the Jet Provost Instrument Trainer. All students have 25hr instruction in this trainer practising instrument and R/T procedures.

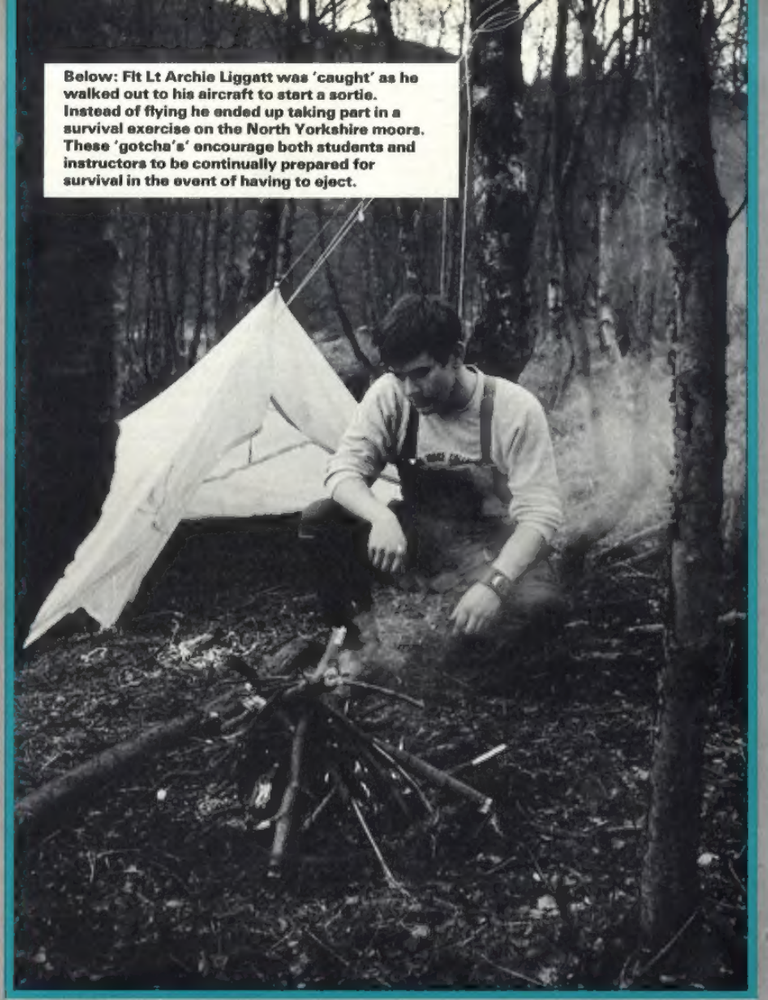
Below: One of the Jet Provost T3As used to train students during the first part of the Basic Course is XM365/37

The 'long' course, as it is known, is common to all basic flying training schools and is a 52 week intense and demanding course designed to train ab initio pilots to a level where they can convert to the Hawk aircraft and progress to Advanced training at RAF Valley. With the introduction into RAF service of considerable numbers of Tornado aircraft, the current emphasis is to produce fast jet pilots, although a small number of students progress to the multi-engine and helicopter streams.

On arrival at Linton the student may feel that he is fated never to fly as the first part of the course is four weeks in ground school. In these four weeks he meets the Jet Provost T3A and is introduced to its many systems. He is given a cockpit check list and is expected to be perfect in his knowledge of the positions of controls and instruments. To assist him there are two cockpit trainers in which familiarisation can take place. The initial flying training is simply concentrated upon the principles of flight and flying with the aim of getting the new student to solo level after about 11hr of instruction. During this period, ground school training is alternating with flying training and several critical points occur where he must pass an examination before he can proceed further. For example before his first solo flight, it is not only necessary that he is competent in the aircraft, he must know a variety of other subjects including some aviation law, as any solo pilot is also 'Captain in charge' when flying.

After solo flight, the course aims to consolidate basic skills and progressively introduce more advanced techniques. Instrument flying is taught early in the syllabus with the aim of qualifying the pilot for a limited cloud penetration certificate after about 30hr. At around this time there is a check upon spin recovery and simple aerobatics. The student now progresses towards his first major hurdles; at 50hr he takes his Basic Instrument Flying Grading test and at 56hr his Basic Handling Test (BHT). The latter assesses the student on all aspects of his training including his proficiency in five aerobatic manoeuvres, and in various emergency drills. The BHT is of such a standard that failure at the first attempt is not uncommon. After BHT there follows more instrument flying encompassing greater skills, diversions away from base, Radar and Precision Approaches, with and without the use of the artificial horizon, limited panel flying and, later in the course, night flying. However, as well as the flying course, the student pilot, as befits his commission, must also continue his officer training. Each course receives General Service Training which improves communication skills, both oral and written, International Defence Studies, and the course must produce a well researched presentation on a given subject which is given to an audience comprising their fellow students and senior officers which includes the Station Commander.

RAF Linton-on-Ouse holds the honour of the Freedom of the City of York, and contributes to several ceremonial occasions during the year. To maintain a high standard



Below: Flt Lt Archie Liggatt was 'caught' as he walked out to his aircraft to start a sortie. Instead of flying he ended up taking part in a survival exercise on the North Yorkshire moors. These 'gotcha's' encourage both students and instructors to be continually prepared for survival in the event of having to eject.

on these occasions, several periods of drill are practised. High priority is also placed on Community Relations and the various courses at Linton are involved in project work in the local villages and communities. Ground School also teaches fieldcraft and survival skills and although much of the work can be taught on the station or in the locality, every course has a week long 'Landex' where the students are taken with their survival equipment into the Pennines or the North Yorkshire moors, to apply in practice survival in the wild with only the equipment that they would have with them if they had to abandon their aircraft. The exercise starts with a 10 mile walk with full packs to simulate ejection shock, once at the required location the students must provide themselves with shelter, warmth and food, as well as preparing survival signals to attract searching aircraft. It is a hard week finishing with a night exercise in which groups of students must find their way across a moorland route, avoiding habitation and also teams of 'hunters' who are tasked to find them.

Towards the end of the basic phase of the flying course a Role Disposal Board meets to discuss the future flying careers of the students. The Board is chaired by a Wing Commander from Support Command HQ, and consists of the Chief Instructor, Squadron and Flight Commanders, and representatives from the Advanced schools at Valley, Finningley and Shawbury. This board will decide whether a student will progress to fast jets, multi-engined aircraft or helicopters. Students chosen to continue in the fast jet phase, stay at Linton, the emphasis of the course changes from basic instruction to one of applying and improving skills already learnt, such as low-level navigation, comprehensive aerobatics, and more advanced instrument flying. Suddenly descriptions of students' performance become much more subjective with terms such as 'flair' and 'aggressiveness' being used to describe their flying. There are three final tests to pass before leaving Linton, the Instrument Rating, the Final Navigation Test and the Final Handling Test. The FNT includes the use of radio aids, diversions to alternative airfields, a low-level exercise to a given target flying at 300kts, and an allowed time over target within 10sec of the declared time. The FHT requires the student to demonstrate knowledge of all skills learnt during the course to a very high standard. He must perform a comprehensive aerobatic sequence, and show that he can cope with

any emergency situations that may occur. This advanced stage of the course is flown in the Jet Provost T5A, which in addition to almost 50% more power than the T3A has improved avionics and a pressurised cockpit.

The standards of the Basic Flying Training Schools are such that unfortunately not everyone can pass. If a student fails to make satisfactory progress he is placed on review, and initially is given more instruction in the areas that he is weakest. If his performance fails to respond, he will fly with the Chief Instructor who, in consultation with his squadron and flight commander will decide whether to terminate his flying training. In this case he is posted to a holding flight while the possibility of alternative careers within the Air Force are considered by HQ Support Command. Some students re-train as navigators, some go to ground duties, but those to whom it is 'pilot or nothing' can be released to civilian life. It was explained to me that every effort is made to get students through the course, 'We don't go out of our way to look for failures, we are looking for pilots', I was told and in view of the standards expected of the School by the RAF a failure rate of the order of 20-30% is not considered excessive.

In order to experience at first hand the level of ability expected of graduates from 1 FTS, the author was invited to join Flt Lt John Halstead at Linton-on-Ouse recently to fly a sortie incorporating many of the elements taught during the course. After a visit to the Station Medical Officer, I was officially pronounced fit, and was fitted out with a bonedome and oxygen mask. Following this was a briefing on the working of the Martin Baker ejection seat as fitted to the Jet Provost. The aim of the sortie was to show a formation take-off, close formation flying and a typical low-level sortie which would illustrate some of the problems associated with navigation at 250ft.

For the student the sortie starts normally at the flight planning stage, where all the details regarding the flight would be worked out, but I joined it at the external pre-flight inspection stage. Almost invariably nothing untoward is found, but very, very occasionally a hawk eyed pilot spots a minor defect and can be awarded a 'good show' in the flight safety publications.

Strapping in completed, John works through his initial check list before engine start. As pressures and temperatures come up within limits 'Aries formation' is cleared to taxi to the active runway. On taxying out, John demonstrates how during this time, further checks can be made if a student is aware, and understands the aircraft systems.

The first part of the mission is supposed to be a formation take-off followed by close formation flying but as the wind speed is out of limits we have to take-off in stream at a five second interval. Checks complete, 'Aries 1' starts his take-off roll and John clicks the stopwatch on the instrument panel, and opens the throttle to wind up the engine, then at five seconds, brakes-off and roll. With a 30kts wind down the runway it is not long before 90kts come up on the ASI and we rotate and climb out to formate with the lead aircraft. For the next 10min I am shown the repertoire of formation flying expected of a student by the end of his course. 'Line astern is easy', John tells me, 'there are lots of visual cues to tell you when you are in the correct place, and when you slot in, you can sometimes just feel the jet blast from the lead aircraft through the rudder pedals'. Moving out of line astern, we progressively move through a variety of formations including turning in formation, not only straight and level, until it is time for us to leave and descend to low-level for the next part of the sortie.

The formation flying has taken us to the west of Linton towards the edge of the Pennines and as the aircraft circle to descend from 7,500ft John points out two reservoirs, conspicuous from height as they are stepped, one above the other, 'Watch those' he tells me, 'That is our entry point and we need to be on a heading 224° at 300kts when we pass over the first lake'. As we descend below 2,000ft I notice that due to the surrounding hills I am starting to lose sight of the lake and below 1,000ft I can only just see part of the lower reservoir. 'This is one of the first problems that a student encounters', says John, 'Lakes and reservoirs look good on the chart, they are coloured blue and easy to see, however in real life, nature puts them in hollows, and unless they are very large, you can't see them until you are over them, by which time it's too late. The students at this point tend to find that they have their hands full setting course and speed, and have to hope that they are in the correct place'.

We pass over the reservoir and the stopwatch is started, 2½min at 300kts is nearly 15 miles over the ground and I'm looking for our first 'feature' mark, a large wood on the west side of a valley, it should be visible for some time before we overfly it and whether we fly by the left or right edge will give us some idea of our track. The valley itself serves as a 'line' feature and will give us an idea of our ground speed. We find the wood on track, but the wind, later estimated at 40kts, makes us about 20sec late. John now uses mental dead reckoning, a quick rule of thumb navigation technique, to work out a new speed that will enable us to regain time and I become aware that at this speed at 250ft it is very rough air. Turbulence from the hills make just flying the aircraft somewhat of a handful without all the extra workload associated with navigation and with running checks. Our next check point is a tower on a ridge, with a valley and a railway to identify it, all points that are not too difficult to spot from the air. While looking for these features I realise that the weather, which had been good to the east of the hills, is very much worse in the west and the cloud clearance on three sides has reduced significantly. It is at this point that we decide to abandon the sortie and return to Linton. John Halstead tells me, 'Safety is keeping your options open, and being aware of what is going on around you, pressing on regardless has killed a lot of people. You must be aware of all that is happening, for example, at this moment we cannot pull up and climb through the cloud, there is an airway above us so we must know our alternatives and act upon them in good time. The exercise that we started is capable of being flown within the safe endurance of the Jet Provost if all conditions are right but there is no margin for serious error. We have to train our students to look out and anticipate, as well as to fly the aircraft, navigate, keep fuel checks and so on, they must be able to reach a target, and recover safely to base'.

Still at low-level we turn safely away from the hills and when clear of controlled airspace climb to recover to Linton under approach radar control. De-briefing afterwards in the squadron crew room, John goes over the points of the sortie, 'You have seen nothing during this sortie that a graduate of the basic course would not be expected to know. We expect them to be able to fly accurate formation, to navigate at low-level, and to be able to make their own decisions, we demand this, and in turn the RAF demands this of us, to train its pilots to these standards'.

What of the future? Low-level training is now one of the most important aspects of flying training, and this is causing some aircraft problems in its wake. The Jet Provost has been in service now for 20 years and the RAF has been evaluating several possible replacement aircraft. The Jet Provost T5A is used in the advanced phase of the basic course, and with much more use at low-level is getting relatively low on remaining airframe hours; fuel consumption of the Viper turbojet is also poor compared with more modern designs. British Aerospace has a new trainer the P164 which has been designed as a Jet Provost replacement; it features a turbofan engine for improved fuel consumption and hence lower operating costs, and there are other aircraft being studied including some turboprop designs. However the process is a complex one as the training value of any one aircraft depends on how it fits into the total training requirement. Changes in one part of a course may need further changes for example in Advanced training if the operating areas of basic trainers are changed. It is hoped that the decision to re-equip will be taken during 1983 with the new aircraft coming into service soon after that.

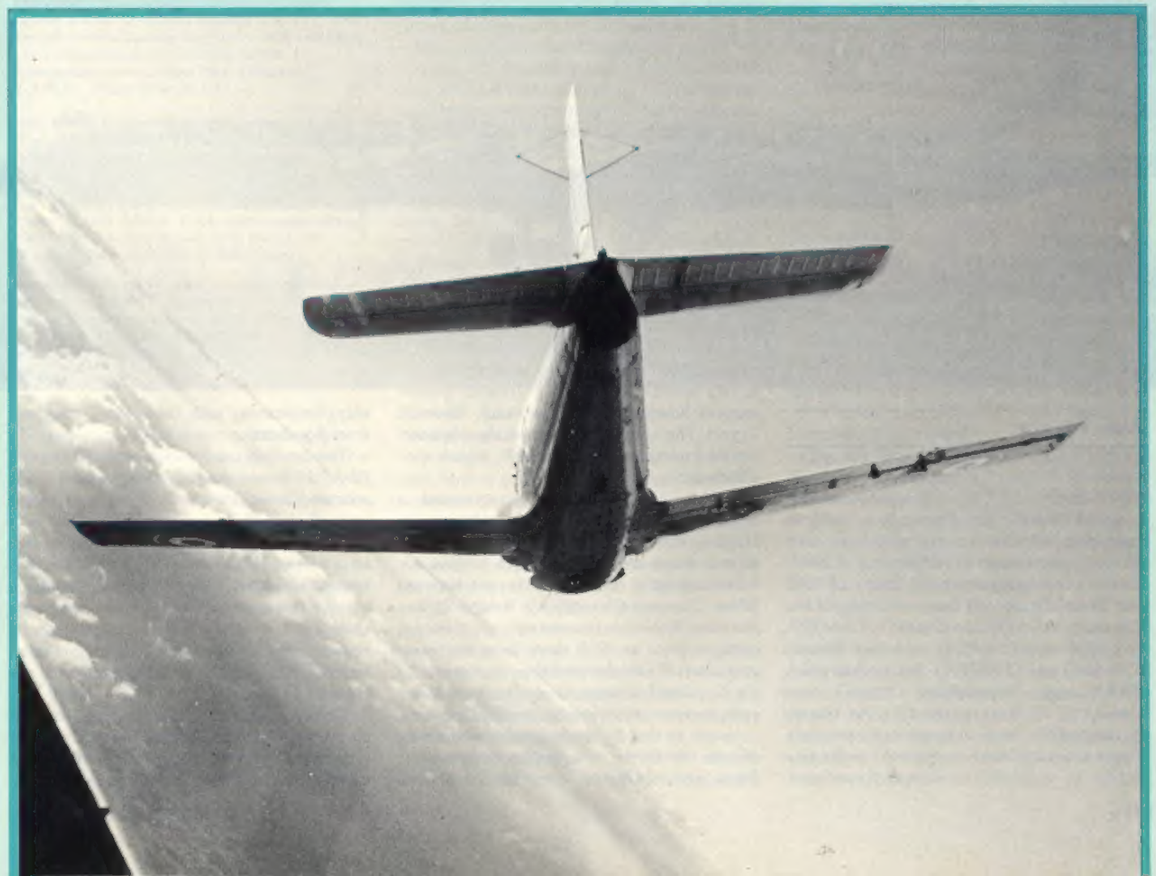
Military flying has never been so demanding of a student as it is now. During its long history No 1 FTS has been responsible for the training of pilots for the air forces of 10 nations as well as the basic instruction of Royal Navy and RAF students. More than 5,000 pilots have received their training at 1 FTS and the professionalism and experience of the instructors at Linton-on-Ouse show that the standards and traditions of RAF flying are being, and will continue to be upheld in the future.

Acknowledgement: The author would like to thank Sqn Ldr Larry Hooke and the officers and students at Linton-on-Ouse, for their help in the preparation of this article.

Left: Student pilots not only have to fly in formation but are taught pairs landings during the advanced part of the Basic Flying Course.

Right: Jet Provost T5A in close formation in a steep left-hand turn during a recent sortie from Linton-on-Ouse.

Below: Jet Provost T5A, XW404/77, taxying-in at the end of a sortie. Used for the more advanced part of the Basic Flying Course, this mark has a more powerful Viper 202 engine and a pressure cockpit. Other visible differences include anti-spin strakes under the nose and at Linton the T5A is not configured with tip tanks.



BAF Air Tours branches out

Alan Wright

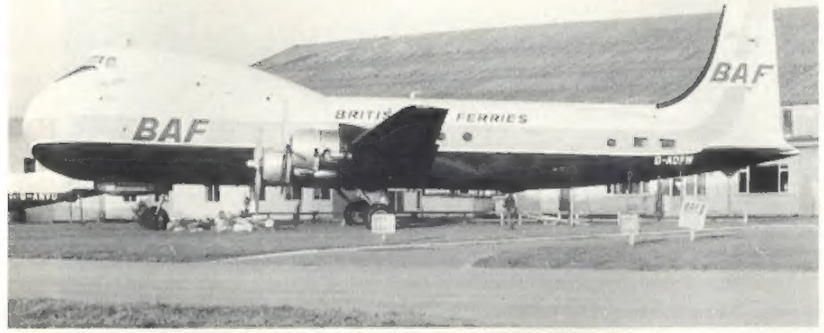
All photos by the author unless otherwise credited

IN February 1983, the UK operations division of British Air Ferries was sold to Jadepoint, a name usually associated with property developments rather than aviation. The new company took the name of BAF Air Tours, its aircraft fleet consisting of five Viscounts (G-AOHM, G-AOYI, G-AOYP, G-APEX and G-APEY) and two Heralds (G-ASVO and G-BAVX). For several years, BAF's main operational activity had centred on IT work to the Channel Islands in conjunction with various tour operators. These contracts were transferred to the new airline as were the associated travel companies Viscount Holidays and Viscount Travel. The sale did not involve the engineering or leasing interests of BAF, which continue unchanged at Southend.

British Air Ferries has experienced a number of course alterations during its lifetime. It was originally created in 1967 after a name change by British United Air Ferries, itself a result of a merger between Silver City and Channel Air Bridge. It was therefore inevitable that the airline's principal business prior to 1970 came from the transportation of vehicles and their occupants to the Continent. Unfortunately the demand for such services was already steadily declining, so much so that by the beginning of the next decade the carrier was seeking alternatives. Passenger only flights were started in a small way, interleaving with the normal schedules from Southend.

The aircraft used was a leased Viscount EI-AOI from Aer Lingus, which was operated from March 1970 through to the end of the 1971 summer season. It was assisted during the second half of its service by a pair of HS748s G-ATMI and G-ATMJ leased from Court Line. With the departure of all three came the announcement in October that BAF had become a wholly owned subsidiary of the Stansted based all-freight airline Transmeridian Air Cargo.

Changes were to be expected and the new chairman, Mr T. D. (Mike) Keegan, did not disappoint anyone. At a time when the vehicle carrying flights had been winding



Above left: Now based at States of Jersey airport is BAF Airtours Viscount G-AOYP. The aircraft carries Jersey Air Ferries titles and has been named *Island of Jersey*. In the background can be seen BAF Viscount G-APEX. *Photo: Allan Burney*

Left: BAF's Stansted operations were short lived, but CL-44, G-AZIN, was painted-up in the airline's livery for use on the scheduled services.

Top: The only survivor of the BAF Carvair fleet in the UK is G-AOFW. It has been restored and stands outside the engineering hangar at Southend as a reminder of times past.

Above: The Herald G-BDFE was the third in BAF's re-equipment programme of 1975, serving for some years as a VIP transport. It is now used for normal passenger work having been replaced in its original role by Viscount G-AOYH.

down, so the trend was reversed by the reinstatement of the deep penetration service from Southend to Basle with Carvairs. However, another development which was far more surprising involved the introduction of a couple of routes using Stansted as the UK terminal. Up to nine flights per day were scheduled to Ostend and one return trip to Basle on four days each week during the summer of 1972. The equipment to be used was the Canadair CL-44, the type which the parent company had employed successfully for some years. Transmeridian certainly had no intention of entering the passenger market, so instead two of its aircraft (G-ATZI and G-AZIN) were repainted in BAF livery in readiness for their new role. The machines were fitted out with 174 seats, although provision was made on certain timings for the carrying of vehicles.

The venture was officially launched on 1 April, but prior to this G-AZIN took a full load of press and travel trade representatives to Ostend on 28 March. Sadly despite showing some promise, the services were soon withdrawn from the BAF route network. The main factor contributing to this action was the unsuitability of the CL-44 for short haul work. The aircraft was quite capable of transporting 174 passengers over 3,500 miles, but it was not at all happy with the 35min hop to Ostend. Also for such operations speedy turn rounds are essential, again something not easily achieved with the type. The airline never included Stansted in its timetables again, which was a pity since having recently suffered the serious loss of Channel Airways, the airport was in great need of regular users.

If the CL-44 project had proved a success, then further developments were planned. The company envisaged the introduction of the type on air cruises to the Caribbean and Far East, restricting the capacious cabin to 100 passengers. The space made available by this reduction was intended to accommodate a cocktail bar, roulette wheel and gaming tables. Flying between the islands, the cruises were aimed at those wishing for something different and a new method of touring in comfort. However it remained an idea, the pair of CL-44s returning to Transmeridian to resume their cargo work.

Sole responsibility for all BAF services therefore rested once again with the ageing Carvairs. The active fleet had by now been reduced to three, so steps were taken to increase this number by taking others out of storage. It provided the opportunity to improve the appearance of the machines both internally and externally. The rear cabin in each aircraft was completely refurbished, while a bright and attractive decor greatly enhanced passenger appeal. An even greater benefit came with the reduction in the number of seats from 22 to 17. This basic total could be increased as necessary by moving the bulkhead separating the compartment from the freight hold. Each flight therefore could accommodate various mixes of cars, freight and passengers as required.

The modernisation programme brought greater standards of comfort to the travelling public, who had hitherto generally accepted the original somewhat drab appearance of the Carvairs as something to be expected of a car ferry. A smart two tone blue livery completed the face lift, each aircraft receiving a new name in keeping with its portly image. Thus *Porky Pete*, *Fat Albert*, *Big John* and others emerged in readiness for the new season.

During 1973 an attempt was made to expand the route network by creating an operations base at Coventry. Four routes were flown from the Midlands city, providing access to France and Belgium at Le Touquet and Ostend in 90min flying time. The other pair served both Jersey and Guernsey, each island also acquiring a link with Bournemouth. As usual the facility for cars and freight to accompany the passengers was offered on the Carvairs, seven of which were operational by this time. In addition after a one year gap, all-passenger flights were re-introduced, this time employing Viscount G-AVIW leased from Alidair. This aircraft was no stranger to Southend since it had spent a busy five years with Channel Airways working from the airport.

As the Viscount lease expired in October 1973, so the winter schedules commenced. Gone were the routes from Coventry and Bournemouth leaving only the Southend to Basle, Le Touquet, Ostend and Rotterdam in the network. During the next summer these were joined by two new services to Dusseldorf and Lyons, but this further attempt at deep penetration flights fared no better than the earlier efforts and were withdrawn at the end of the season. Some form of Carvair replacement was becoming increasingly necessary.

The decision was taken to run down the car ferry operations in favour of passenger services. In January 1975 three Heralds were acquired from the Canadian carrier Eastern Provincial Airways, two of which registered G-BCWE and G-BCZG, arriving in time for overhaul and summer service alongside the remaining Carvairs. The third aircraft was selected for conversion to a 21 seat VIP version for use on special charters, taking the UK registration G-BDFE. The arrival of more Heralds during 1976 hastened the demise of the car ferry schedules. These were finally withdrawn at the end of the year, the remaining Carvairs carrying on as pure freighters for a time.

Right: BAF's experience with the Viscount is not restricted to its present fleet. In 1973 G-AVIW operated with the carrier on lease from Alidair.

Far right: Reflections on the dragon of Jersey — Viscount G-AOYP on the apron at Le Touquet airport. *Photo: Allan Burney*

Below: Miss Battle of Flowers, Kay Butell, celebrating the inaugural Jersey Air Ferries flight with the crew of G-AOYP at Le Touquet, France on 27 April. *Photo: Allan Burney*

BAF's appetite for Heralds seemed insatiable. The eight strong fleet of the Royal Malaysian Air Force was purchased, the aircraft being flown back at intervals between August 1977 and March 1978. One was too badly damaged to make the long journey, so it was cannibalised on site. As a result of this influx, the airline became the largest operator of the type in the world for a time. The scheduled services still took in the familiar destinations of Basle, Le Touquet, Ostend and Rotterdam plus a short lived revival of the Calais route, but 14 Heralds were certainly not needed to cover these relatively short sectors. Instead they were offered for sale or lease, resulting in aircraft appearing in many strange liveries and logos. While this side of the business began to grow into a profitable enterprise, the scheduled operations were becoming increasingly difficult to maintain without losses. In the meantime, 1977 had seen the parting of BAF and Transmeridian when the cargo carrier was sold to Cunard, the Southend company remaining with the Keegan Group.

British Air Ferries carried on with its operations for another year, until towards the end of 1978 its entire network was transferred to British Island Airways. This airline also took six Heralds on long term lease to cope with its newly expanded route system. Released from the burden of the scheduled services, BAF was able to concentrate on its leasing, engineering and cargo activities. One Herald (G-BEYG) was converted into a freighter, the work increasing its payload to nearly 6,000kg. The aircraft was subsequently used for trips to Basle and Dusseldorf on behalf of BIA/Air UK, who had also found that the routes were unprofitable using the relatively large capacity machine on low density services.

With the availability of the well maintained but inexpensive Viscounts retired by British Airways, BAF turned to new ventures in the IT market, offering attractive rates to tour operators to destinations all over Europe. Initially six aircraft were acquired, the first to arrive at Southend being G-AOHV, a series 802 which had started work with British European Airways in July 1957. The newcomers were completely refurbished by BAF Engineering, its new paint scheme and internal decor resulting in a very attractive machine. As in the case of the Heralds, the Viscounts were offered to overseas operators on lease, which resulted in the aircraft's rapid departure to such countries as Algeria and Libya immediately after overhaul. The contracts obtained encouraged BAF to purchase more of the type from BA, until eventually 18 were taken over plus one used as a cabin trainer at Southend. Not all entered service however, some remaining at their old base at Rhoose awaiting employment. Towards the end of 1982, the airline once again opted out of operational flying in favour of its leasing and engineering divisions.

It did not take long after the setting up of BAF Air Tours for the new owners to announce some expansion. A subsidiary airline was formally launched on 27 April 1983 taking the name Jersey Air Ferries with its headquarters on the Island. Its initial equipment was a pair of Viscounts transferred from the parent company.

This action was taken not only because of the considerable amount of work generated by the Channel Islands, but also to provide a larger charter facility with its roots in Jersey. JAF also plans to expand by adding scheduled services to its activities at an early date, the first hopefully to be Jersey-Manston. Certainly Kent has been poorly served by the airlines since the seasonal

Lydd route was withdrawn a couple of years ago, so this replacement should be welcome. Eventually the company would like to offer services to various European centres, Rotterdam likely to be a candidate for an early licence application. Since the number of charter flights allowed into Jersey is restricted by the authorities, the addition of schedules would help to balance the employment of the fleet and of course bring more business to the hoteliers.

The inaugural flight was made by Viscount G-AOYP wearing Jersey Air Ferries' titles along the upper fuselage. A red dragon was painted on the lower part of the fin, but otherwise the colour scheme remained the same as that of BAF. It is intended that a new livery will be adopted in due course, but there has been no decision yet as to the form it will take.

After its hour long trip from Southend to Jersey, 'Yankee Papa' was Christened *Island of Jersey* by Kay Butell, the current holder of the unlikely title *Miss Battle of Flowers*. These formalities over, the Viscount flown by Capt Peter Meldrum and Capt Clive Parks, set off for Le Touquet, a one-time regular haunt of BAF. Normally two cabin attendants are carried to serve drinks and snacks or sell duty free goods, but on this occasion three girls, Jean Addis, Gare Williams and Gwen Dunne, were all kept busy during the flights.

An interesting addition to the usual ventilation system was the provision of five small fans spread along each side of the cabin above the coat racks. Apparently these had been fitted when the aircraft was on an African lease in order to boost the draught, but will be recovered now that the airliner is back in more temperate climes. The Viscount confirmed that it is still an extremely pleasant transport, with comfortable seats set at a pitch giving adequate leg room. Back at Jersey the Southend bound passengers transferred to G-APEX, leaving 'Yankee Papa' to make itself at home at its new base.

Conveniently BAF Air Tours has ready access to the leasing fleet of BAF Engineering, a facility quickly taken advantage of after Polar Airways ceased operations in April. Some of this carrier's commitments were taken over by BAF hence the need for additional capacity, which was supplied by the arrival of G-AOHT.

Although 1983 will generally be a year of consolidation, the company will continue to seek ad hoc charter business both passenger and freight. The two Heralds are employed on the regular Dusseldorf and Basle cargo flights, still wearing the distinctive yellowish green and black livery applied when earmarked for a long term lease with a Panamanian company. Both are expected to be repainted during the summer. While the question of new equipment has been considered in general terms, no firm conclusions have been reached. After all, there is no desperate urgency to replace the Viscounts with modern jet airliners purely for change sake. It has been tried before and the survival record is not good. Hopefully then, the BAF/JAF Viscounts will continue to serve the airlines and the public for many years to come.

As joint first prize winners of the 'Army Air 82 photo competition', Stuart Brown and Chris Farman visited Booker Aerodrome on 16 April to represent *Aircraft Illustrated* on an air-to-air photographic sortie with the world-famous Marlboro Aerobatic Team. Each photographer was flown by Nigel Lamb in Pitts S2A G-ROLL, which acted as the cameraship, while Phil Symmans positioned G-WREN for their cameras in a series of pre-planned manoeuvres. The aerobatics and restraining straps in the Pitts' cockpit make it difficult for the photographer to change film during flight, so Chris Farman chose to shoot mainly black and white while Stuart Brown opted for colour. The results of their photography can be seen on this and accompanying pages, together with a brief description from each prize-winner on their impressions of the flight.

We would like to extend our grateful thanks to all involved with the Marlboro Aerobatic Team for providing this unique opportunity for our prize-winners.

Chris Farman

AFTER an attempt to receive my prize was foiled by winds gusting to 45kts on the Monday, it was pleasing to arrive at Booker Aerodrome on a calm, sunny Saturday to meet the Marlboro Aerobatic Team. As they are much photographed subjects there are few, if any, original ways of photographing the team and so my intention was to enjoy the flight and record it on film to help recall memories in the future. Although I have done a reasonable amount of small aircraft flying I had never experienced aerobatics. To my pleasure (and possibly to Nigel Lamb's surprise!) I felt no discomfort during the flight and thoroughly enjoyed vertical rolls, stall turn, loops, flick rolls, knife edged and inverted flight. This was all done with the pilots positioning the aircraft for the best lighting and backdrops and with the second Pitts sometimes filling the frame of a 35mm lens! The main problem photographically was trying to heave the camera up above the cockpit edge during high 'G' manoeuvres.

Unfortunately it was soon time for a snappy landing and to bid farewell to Philip, Nigel and Phil who had an afternoon's practice ahead of them. Well, I'd do anything once but would I do it again? Just give me a minute to get my camera.

Left: Pulling up into the vertical at the start of a loop and . . .

Right: . . . over the top. Phil Symmans holds G-WREN off the starboard wing of the cameraship during the photo-sortie on 16 April. *Photo: Chris Farman*

Below left: The prize-winners of the 'Army Air 82 photo-competition' together with their pilots for the air-to-air sorties. From left to right are: Phil Symmans, Chris Farman, Nigel Lamb and Stewart Brown. *Photo: Allan Burney*

Stuart Brown

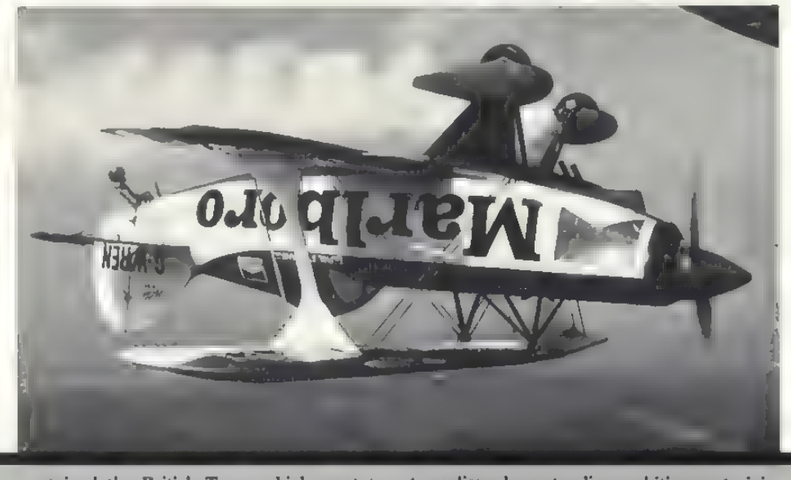
THE precision flying and perfect judgement demonstrated through much practice by the famous Marlboro Aerobatic Team, will, so often, have been captured on film all over Britain. Between the usual gasps of excitement many will have photographed the tight formations and dramatic opposition passes from the comfort of the ground at air shows, fetes and displays.

Few though will have had the unique and highly exhilarating experience of flying with the team to carry out air-to-air photography. Voluntarily thrown into the deepest of deep ends this was to be my first flight in a fixed-wing aircraft and certainly the first with an aerobatic display team. The true sensation of flying is clearly felt in the small and highly responsive Pitts S2A biplane, especially when executing such manoeuvres as loops, rolls, flick rolls and stall turns.

Probably the most disorientating of these (for me anyway) were the loops. The aircraft would push down into a shallow 20° dive to build the airspeed up to 200mph then, quite suddenly, pull up into the vertical. The acceleration or 'G' meter read +3.5-4G, a figure later quoted as 'nothing' compared with the 5.5G pulled in the display loops. It was quite enough though to tug heavily at my camera and draw the blood from the upper half of the body.

Although not the easiest conditions in which to carry out photography, considering the forces and strong slipstream, it was extremely satisfying to have a viewfinder full of a bright red and white Pitts as it rocketed skyward over the Buckinghamshire countryside, smoke streaming from the engine exhaust pipes.

Once again I say thank you to the team, Philip Meeson, Nigel Lamb and Phil Symmans, for a thrilling flight on a most memorable day.

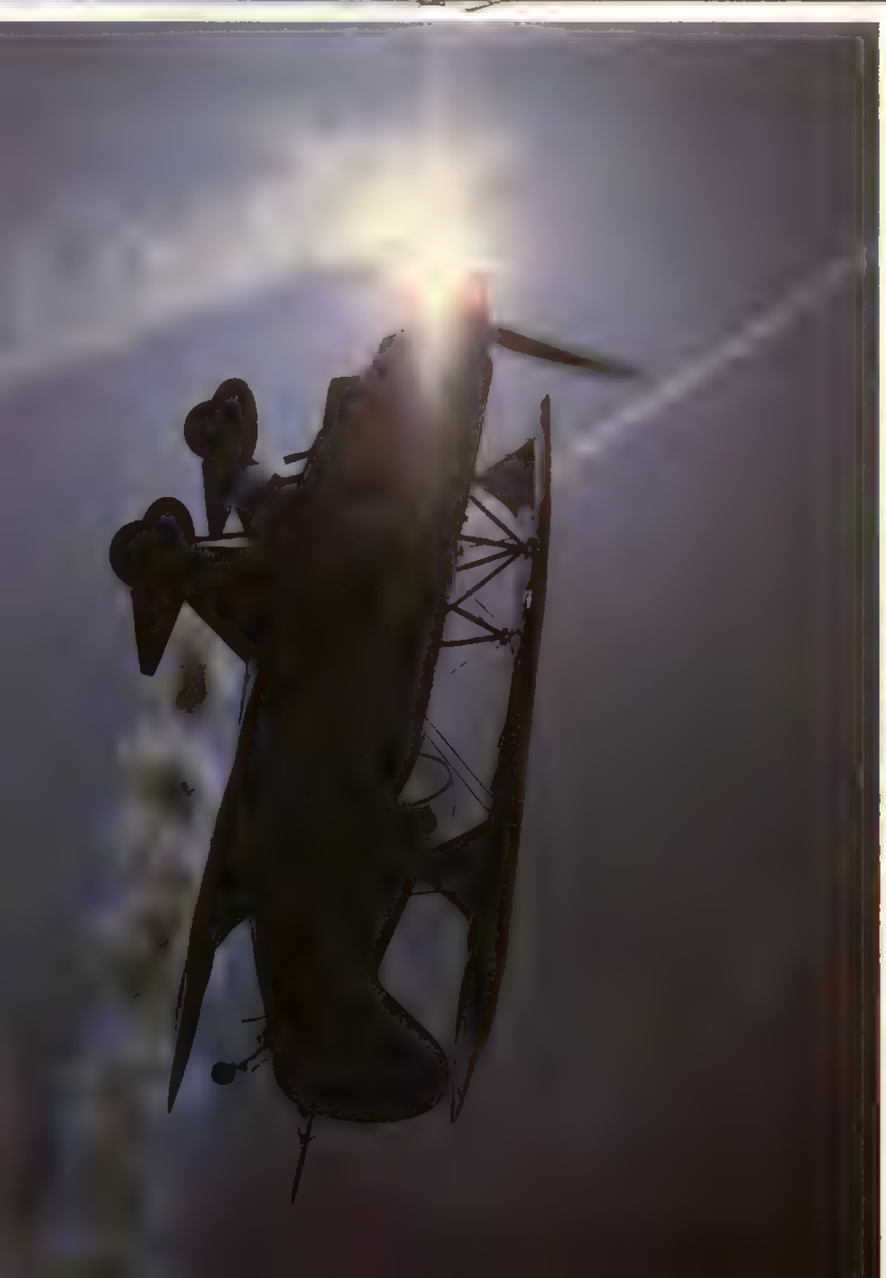


The pilots

Leader of the Marlboro Aerobatic Team is four-times British Aerobatic Champion **Philip Meeson**. He was commissioned in the RAF in 1964, where he flew many different types of aircraft, and won the prize for the best all round pilot on both his basic and advanced flying courses. In 1970 he left the RAF for a civilian career and from then on concentrated on aerobatic flying. While on a business trip to the US he saw and fell in love with the Pitts Special, which was at that time just beginning to be recognised as a competition aircraft. He was determined to build the first of its type in the UK, bought the plans for $100, and set about the task of organising its construction. His Pitts Special completed, Philip began entering for the annual British Championships and over a period of three years worked himself up in the placings until he came second in 1977. In 1978 he won the competition for the first time, and held the title for four consecutive years. He was a member of the British Aerobatic Team at the European Championships in Denmark in 1975, the World Aerobatic Championships in 1978 at Kiev, and captained the British Team which went to the World Aerobatic Championships in the US in 1980.

Twenty-six year old **Nigel Lamb** was born and grew up in Zimbabwe, then Rhodesia, and came to the Marlboro Aerobatic Team straight from a career in the Rhodesian AF. His interest in flying was stimulated by his father who was an RAF fighter pilot during WW2 before becoming a farmer in Rhodesia. From early childhood Nigel's ambition was to join the Rhodesian AF, and in 1975 he succeeded. His pilot training was carried out on the Piston Provost and the Vampire, and even this stage of his career was not without excitement. He was lucky enough to survive a Vampire forced landing in the dense Rhodesian bush, when he had an engine failure. In 1976 Nigel was commissioned and was awarded the Sword of Honour as the most outstanding student of his year. He chose to fly helicopters, and was posted to squadrons with Alouettes and Bell 205s. After this tour Nigel qualified as an instructor and flew the Siai Marchetti SF 260 aircraft training Air Force pilots. Throughout his career Nigel had taken every opportunity to fly aerobatics, and at the end of the conflict in his own country he felt able to realise a long standing ambition — to join a professional aerobatic team. Now in his third season with the Marlboro Team, Nigel has given aerobatic displays throughout the UK, in Europe and in North Africa.

Ex-fighter pilot, 24-year old, **Phil Symmans** joined the Marlboro Aerobatic Team direct from the Royal New Zealand Air Force and its formation aerobatic team. Phil started his flying at an early age by 'scrounging' rides — initially by riding behind the pilot in crop spraying aircraft on his family's farm and then by taking odd jobs to earn enough money to take flying lessons at the local airport, In 1976 Phil accomplished one ambition in life to join the RNZAF. He was fortunate to be on the last flying course to be trained on the Harvard and continued his advanced training on the Strikemaster. He was posted to fly that aircraft operationally before being selected to fly in the RNZAF Aerobatic Team as their youngest ever formation display pilot, at 19. In 1979 Phil was transferred to No 75 Squadron RNZAF operating the McDonnell Douglas A-4 Skyhawk and during three years' flying he deployed to Australia, Indonesia, Singapore, Malaysia and the Philippines to operate with and in mock battles against their fighters.



IN COLOUR!

Marlboro
AEROBATIC TEAM

Top: April sunlight reflects off the canopy and wings of Pitts S2A, G-WREN, as Phil Symmans pulls the aircraft up for a loop at 200mph. *Photo: Stuart Brown*

Above: Ex-Rhodesian AF pilot, Nigel Lamb, photographed from the front cockpit of the cameraship by Stuart Brown. When operating as a single seat aircraft, the front cockpit of the S2A is faired over and a sliding canopy is fitted to the rear cockpit.

Left: Into the light — one of the photographs planned by Chris Farman during his photo-sortie with the team on 16 April.

TANKING 25

Peter R. March

AT the beginning of April RAF Marham celebrated 25 years of air-to-air refuelling in the RAF and 21 years since the formation of the first operational tanker squadrons. An air show was held at the Norfolk base, home of Nos 55 and 57 Squadrons, on 9 April to mark the occasion.

Although in-flight refuelling dates back nearly 60 years, it has only been for the past quarter-century that the RAF has had more than a passing interest in developing the techniques for operational purposes. Initial air-to-air refuelling trials took place in 1924 at the Royal Aircraft Establishment, Farnborough using a pair of Bristol Fighters. Ten years later a competition was held by the RAF for the continuation of trials, and significantly the winner was Alan Cobham, whose firm eventually became the pioneer of the system to be adopted by the British and many overseas air arms.

Several methods of aerial refuelling were tried, most involving the 'tanker' aircraft releasing a line which was hooked up using a grapple by the 'receiver'. The hose was then pulled in and connected to the receiver's tank and fuel transferred by gravity feed. It was planned to use a more refined version of this to refuel the Tiger Force in the bombing raid against Japan in 1945, but the surrender following the atom bomb devastation obviated the need for this.

By the early 1950s Sir Alan Cobham's Flight Refuelling Ltd had developed the now standard probe and drogue method and successful trials were held using Lancasters as tankers refuelling Meteor F4s of No 245 Squadron. However, it was not seen at that time that air-to-air refuelling was needed for fighter aircraft but rather more that the effectiveness of Britain's nuclear deterrent V Force could be enhanced by this facility. In 1958 No 214 Squadron was tasked with refuelling trials with two of its Valiants being modified as tankers. A number of non-stop long-distance flights were then made to Aden, Kenya and South Africa which proved the effectiveness of the system. As a result two Valiant tanker squadrons, Nos 90 and 214, became operational for the first time at Marham in April 1962.

Unfortunately the service life of the Valiant B(K)1A was cut short in 1965 when wing fatigue problems were discovered. A replacement for what was now an essential role was found in the Victor K1. In its interim configuration the Victor was fitted with wing mounted refuelling points only and the first of such aircraft were delivered to No 55 Squadron at Marham in May 1965. Just over a year later the three-point Victor K1A was delivered to No 214 Squadron at Marham. By this time policy changes had reduced the need for the tankers to be used to extend Vulcan bomber range and introduced the important new concept of in-flight refuelling for fighter aircraft, both by extending endurance and range for combat air patrol and for world-wide deployments. Squadrons of Lightnings and Phantoms made several very long flights to the Near and Far East during the late-1960s and during the next decade the tanker squadrons became very much involved in NATO and UK air defence activities as a matter of routine.

In-flight refuelling also became standard practice for the Fleet Air Arm. While deployments made use of the RAF's Victors, the Royal Navy also had its own 'mini-tankers' in the shape of Scimitars, Buccaneers and Sea Vixens fitted with the Flight Refuelling developed 'buddy' system. These under-wing mounted hose and drogue pods could be rapidly fitted to standard carrier-based aircraft which could then act as air-to-air refuellers to extend the range or CAP time for other aircraft on operational sorties.

With the Victor B1 well proven in its secondary role, the retirement of the B/SR2s in 1974 presented the opportunity for an improved tanker to be developed. The Rolls-Royce Conway powered Victor K2 was first flown at Woodford on 1 March 1972 and delivery to the RAF commenced on 8 May 1974, entering service with No 55 Squadron on 1 July 1975. No 57 Squadron was re-

Top left: Up to date — a Victor K2 tanker of the Marham Wing refuelling a Phantom FGR2 of No 56 Squadron, with a second aircraft about to engage. *All photos: Peter R. March*

Bottom left: In the beginning — Valiants of No 214 Squadron Marham 'hooked-up'.

Below left: Who gets the juice? — an amusing 'extra buddy' flypast by three Sea Vixen FAW2s of No 892 Squadron at Yeovilton.

Below: In the 1960s — USAFE support by a KB-50J for UK-based F-101 Voodoo, B-66 Destroyer and F-100 Super Sabre.

equipped a year later, but No 214 Squadron soldiered on with its K1s until it disbanded on 28 January 1977. From the total of 24 planned conversions there was a fleet of 19 Victor K2s (XH669, XH671, XH672, XH673, XH675, XL160, XL161, XL162, XL163, XL164, XL188, XL189, XL190, XL191, XL192, XL231, XL232, XM715, XM717) with the Marham tanker wing of Nos 55/57 Squadrons and 232 OCU in April 1982 when they were called upon to take a leading role in support of the Falklands Task Force. Many of the aircraft were deployed to Ascension Island where they not only refuelled the Vulcans, Harriers, Sea Harriers, Nimrods, Hercules and Phantoms, but also became involved with the tasks of the former Victor SR2s — maritime, radar and photo reconnaissance.

The inadequacy of the two squadrons to support the RN and RAF in the Falklands War while maintaining their UK air defence and NATO tasks pointed to the need to speed up the strengthening of the tanker fleet. The planned introduction of a squadron of VC10 tankers to support the Tornado F2 could not be accelerated (by April 1983 only two of these conversions had flown). As a short-term measure four Hercules C1s (XV192, XV201, XV204 and XV296) were converted by Marshalls of Cambridge as air-to-air refuellers, with a single centre-line hose and drogue. These were mainly for service on the Ascension Island-Falklands airbridge and remain in that task. To help the UK air defence shortfall British Aerospace converted six Vulcan B2s (XH558, XH560, XH561, XJ825, XL445 and XM571) as single point tankers. These entered service with No 50 Squadron at Waddington last autumn and are likely to remain operational until replaced by the VC10 K2s and K3s in 1984. Another lesson from the Falklands War was the underlined need for a 'super-tanker'. This is to be met by the purchase of six TriStar 500s from British Airways and conversion by Marshall into strategic tanker/transports.

In-flight refuelling has moved a long way from being an interesting experiment just a quarter of a century ago to being an essential feature of air defence and strategic support. Although the USAF adopted a different refuelling system it has long given a high priority to the provision of tankers, both for Strategic Air Command and its tactical and air defence units. The USAF in Europe has received support from KB-29s, KB-50s, KC-97s, KC-135s and more recently KC-10s. Both Mildenhall and Fairford are very active tanker bases, particularly when deployments see whole squadrons crossing the Atlantic for Reforger exercises. Aerial filling stations are a relatively new phenomenon, but they are certainly here to stay.

Above: A different system — the USAF adopted the 'flying boom' for its tankers, as shown by this KC-97G of the Ohio ANG.

Below: The drogue and probe — a No 57 Squadron Victor K1A refuelling a pair of Binbrook-based Lightning F6s fitted with overwing fuel tanks.

Warbirds at Biggin

Photo feature by **Peter R. March**

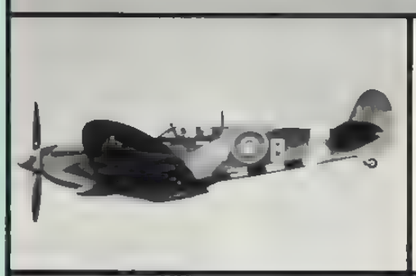
THIS year's Biggin Hill Air Fair, 14-15 May, presented the largest and most varied collection of warbirds yet seen in this country. Individual displays were given by a host of British and American types including one former US Navy machine that was making its UK show debut.The finale was a set piece in which the B-17 *Sally B* made a bombing run over the airfield and was attacked by the Me108 (Nord 1002) and Fw190 (scale replica). Ray Hanna was scrambled in his recently acquired Spitfire IX MH434 and a dog-fight ensued, with the Spitfire of course being victorious. In true Confederate Air Force style the display ended with a balbo of all the warbirds, the impressive formations being led by the Battle of Britain Memorial Flight's trio of Hurricane, Spitfire and Lancaster. Jock Maitland is to be congratulated in producing a unique sight, at least for 40 years, over Biggin Hill and it is to be hoped that this will not be the last time that this major air show looks back at the heyday of the piston-engined fighter and bomber.

Above: B-17 *Sally B* making a bombing run while Hurricane LF363 (in its new all-black paint scheme and No 85 Squadron code VY-X) waits for take-off. *Sally B* was giving its first display of the year and looked very smart with its yellow/black checked cowling on the starboard inner engine in memory of the late Ted White. *Photo: Andrew March*

Left: Warbird formation — B-17 leading a Mustang, Spitfire and Corsair; the latter is owned by Lindsay Walton and was appearing at Biggin Hill for the first time, having arrived on the UK air show scene last August. *Photo: Andrew March*

Below: Stephen Grey's Mustang making a sweep across the airfield at low-level.

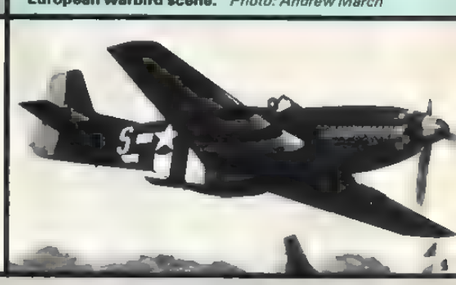
Bottom: The FM-2 Wildcat of Stephen Grey gave its first display in this country at the Air Fair and is another welcome addition to the European warbird scene. *Photo: Andrew March*



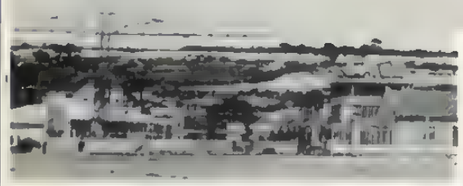
Left: Spitfire IX MH434, purchased by Ray Hanna's consortium for £260,000 at the Duxford sale in April, now has the new code ZD-B, the markings actually carried when it was in service with No 222 Squadron.

Below left: Another 'enemy' was the Me108 (Nord 1002) flown by Lindsay Walton.

Bottom left: Storch (MS500) G-AZMH giving its impressive STOL performance at Biggin.



The rotary craft of Aérospatiale



David Oliver *reports on a visit to Aérospatiale's Helicopter Division at Marignane*

SITUATED on the southeast perimeter of Marseilles' Marignane Airport is a vast complex of workshops and hangars where more than 6,000 helicopters have been produced during the past 30 years.

This is the home of Aérospatiale's Helicopter Division, one of the busiest and most successful aircraft factories anywhere in the world, where 100 new machines currently leave the crowded production lines every month. The final assembly shops are housed in some of the enormous hangars that were originally built by the Sud-Est company for giant flying-boats and having survived WW2 they were used to finish the prewar designed SE200 in the late-1940s. The company then turned to producing licence built versions of the DH Vampire and Venom, known as the Sud-Est Mistral and Aquilon respectively, some 400 of which left the production lines between 1951-1954.

On 16 December 1953, Sud-Aviation as the company was then known, flew the world's first tip jet helicopter, the two-seat SO-1221 Djinn powered by a 240ehp Turbomeca Palouste IV. Of the 150 examples of this type built, 100 were delivered to the French Army AF (*Aviation Légère de l'Armée de Terre — ALAT*) and three were evaluated by the US Army. It was, however, the company's next design, the SE-3130, named Alouette II or Skylark, that broke the US domination of the world's helicopter market.

The Alouette II, which first flew on 12 March 1955, was a five-seat general-purpose helicopter powered by a 400shp Turbomeca Artouste II turboshaft and is still considered by many pilots and operators as the best in its class, with many of the 928 built remaining in service throughout the world and outliving many of its American contemporaries. A seven-seat derivative powered by the more powerful Artouste III flew in March 1959 and is still in production with more than 1,800 Alouette IIIs delivered to date.

Top left: The maiden flight on 7 April 1967 of the Sud-Aviation SA321F, the commercial version of the Super Frelon; carrying 34-37 passengers the SA321F served briefly with Olympic Airways in 1972. *Photo: Aérospatiale*

Centre left: An aerial view of the Aérospatiale Helicopter Division at Marseilles-Marignane.

Bottom left: Lifting-off at Marignane for its maiden flight on 17 April 1962 was prototype 002 of the SA340 Gazelle; note the 'T' tail that in production models was replaced by a taller fin and small horizontal stabilisers just forward of the fenestron (enclosed tail rotor). *Photo: Aérospatiale*

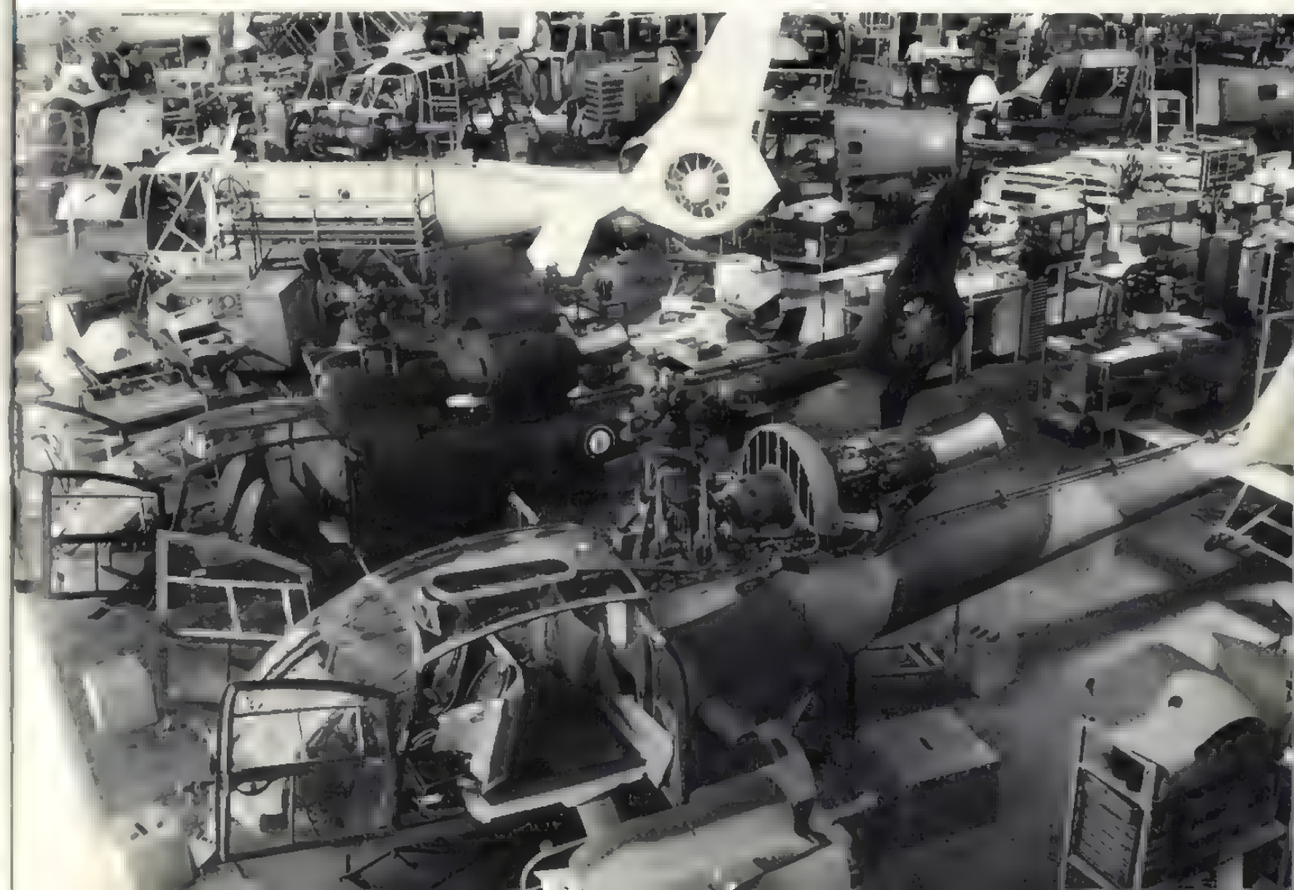
Below: The final assembly line at Marignane showing SA365Ns and SA342 for the French Army and a HOT-equipped SA342 for a Middle-East customer.

All photos by the author unless otherwise credited

Less successful, in terms of numbers produced, was the three-engined multi-purpose/medium transport SA321 Super Frelon which made its first flight in December 1962 with 57 being built over a period of 10 years. Of these, 16 ASW models, the SA321G powered by three 1,550shp Turbomeca Turmo III turboshafts, serve with the French Navy (*Aéronavale*), while transport versions are operated by the air forces of Israel (SA321K), South Africa (SA321L) and Libya (SA321M). A commercial SA321F, carrying 34-37 passengers served briefly with Olympic Airways in 1972.

By the mid-1960s, the Sud-Aviation Company had merged with a number of other French aircraft manufacturers to form Aérospatiale and one of the first products of the new group was the SA330 Puma, a twin-engined medium transport helicopter which first flew in 1965, designed to meet French Army requirements. Powered originally by two 1,320shp Turmo III turboshafts, the Puma was chosen as a joint production project between Aérospatiale and Westland which resulted in the British Company producing 40 Pumas (SA330E) for the RAF and some 15% of the components for all Pumas of which some 750 have been ordered to date. The latest version on the production line is the SA330J powered by two 1,575shp Turbomeca IVC turboshafts, a civil version aimed at the offshore oil company market as is the stretched version known as the Super Puma (AS332L). Two 1,755shp Turbomeca Makila turboshafts power the 20-seat Super Puma that first took to the air at Marignane in October 1980, and its immediate success with Europe's offshore oil support companies caused a great deal of concern to Bell and Sikorsky, which up to that time had a virtual monopoly in this lucrative sector of the helicopter market. A leading factor in Aérospatiale's launch of the Super Puma was an order for 35 of the stretched AS332Ls from the UK-based Bristow Helicopter company which already operated a number of SA330Js. Bristow's aircraft, known as the Tiger, has a number of exclusive features including enlarged windows, redesigned doors, extra soundproofing and are fitted with 19 Airbus-type passenger seats. Other North Sea oilfield support companies to subsequently order the Super Puma include British Airways Helicopters, North Scottish Helicopters and the Norwegian Helikopter Service concern while orders for the military version, the AS332M, have come from the Spanish, Chilean and Argentinian air forces. A naval ASW model, the AS332F, is also being offered equipped with Thomson-CFS Agrion radar, sonar, homing torpedoes, AS15TT anti-ship missiles or AM39 Exocets. Around 120 Super Pumas are currently on order and a production rate of six per month is planned by mid-1983.

The last design initiated by the Sud-Aviation company was a five-seat utility design powered by a 592shp Astazou, intended as a successor to the Alouette II. The SA341 Gazelle first flew in 1967 and was to become the second of three helicopter types to be covered by the then fashionable



Anglo-French production agreements between Aérospatiale and Westland. Despite a number of serious teething problems, the Gazelle has become another of the French company's success stories, with more than 1,100 being ordered to date, including some 250 produced by Westland for the British Forces and 50 examples built under licence in Yugoslavia.

A more powerful development, the SA342 with an 858shp Astazou XIVH, is leaving the Marignane line at a rate of 10 per month. The SA342 may be fitted with up to six HOT missiles, a 20mm cannon and door mounted 7.62mm guns. A request was made by the British Government for Aérospatiale to produce kits for the latter to be fitted on the British Army's Westland SA341Bs during the Falklands War, but they were not compatible with the earlier model and could not be adapted in the short time that was available. The third type covered by the Anglo-French co-operation agreement was the Westland Lynx which is a British design with about 15% of French made components including the rotor head that is machined out of a single piece of titanium at Marignane. The 33 Lynx ordered by the *Aéronavale* in an ASW role are fitted with French equipment by Aérospatiale, and have been fitted with uprated engines.

The spacious and landscaped factory at Marignane accommodates 5,000 production workers, 600 of whom are engaged in quality control, and a design office of 700. Flexi-hours are worked on the shop floor, and if the production team complete their job in less than the allotted time, they go home. TV-equipped rest rooms are provided as is superb food in the works canteen — not surprisingly there have been no strikes in the past ten years!

A part of the factory is taken up with rebuilding of gearboxes, rotorheads and hydraulics, whose tolerances are checked with computerised measuring equipment, and which are re-assembled in air-conditioned work-shops. An even larger area is now involved in Composite Technology, utilising carbon and glass fibres. Whereas carbon fibre rotor blades have been produced by many leading helicopter manufacturers, Aérospatiale broke new ground when it launched the AS350 Ecureuil (Squirrel) as the first of a new generation of helicopters making extensive use of composite technology which has revolutionised the production techniques at Marignane.

The six-seat general purpose AS350 first flew in 1974 and production versions are powered by both the 641shp Turbomeca Arriel and, primarily for the US 'JetRanger' market, a 615shp Avco Lycoming LTS-600A2 turboshaft. The Ecureuil features many thermoformed glass-fibre body parts including the complete main cabin canopy, carbon fibre rotor blades and the unique Starflex rotor hub made entirely of epoxy glass composite, the advantages of which, according to Aérospatiale, are lightness (the Ecureuil hub is half the weight and one third of the cost of an Alouette or Gazelle hub made of conventional metal), better fatigue strength and easier maintenance. The company has long experience of thermoforming large panels of high-quality plexi-glass used for the canopies of Alouettes, Gazelles etc, as well as cockpit canopies for Jaguars which it still produces, so thermoforming of glass-fibre body panels was a logical extension of known technology. The AS350 is constructed like a plastic-model kit with glass fibre body panels being heat-bonded together around a metal-Nomex floor unit, while the metal rear fuselage unit is manufactured by Aérospatiale's light aircraft division, SOCATA, at Tarbes. A two-man team assembles the whole aircraft, which is supported on a frame that can be tipped on its side for ease of assembly and paint spraying without the use of conventional jigs.

Nearly 600 AS350s have so far been ordered, included in which are the first orders for military versions that were announced in 1982 — 12 by the Royal Australian Air Force (trainers), six for the Royal Australian Navy (liaison and survey) and eight trainers for the Brazilian Navy where they are known as Esquilos.

In response to the Avco Lycoming-powered AS350D's success in North America, where it is known as the Astar, particularly with the offshore oil support and EMS (emergency medical service) companies, Aérospatiale announced a twin-engined development of the Eucreuil that was flown for the first time in September 1979. The AS355F Ecureuil 2 is powered by two 420shp Allison 250-C20F turboshafts fitted into the same airframe as the AS350. It is being produced at a rate of 40 per week with a target of 50 per week by the end of this year, against an order book of more than 450, most of which are from the US market where it is known as the TwinStar.

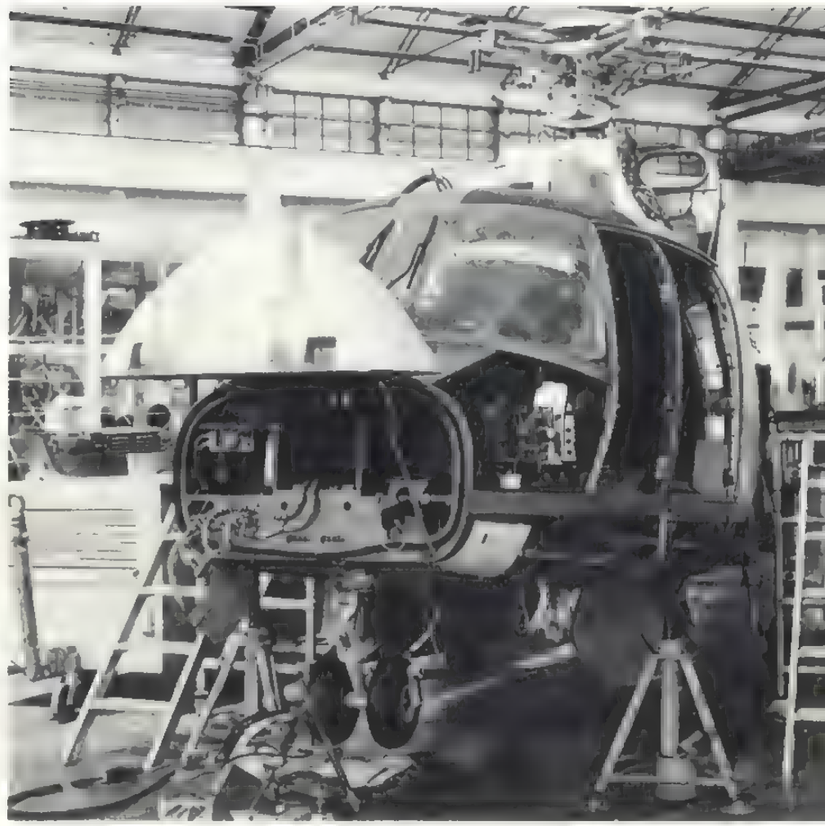
The author was able to appreciate the AS355 at first hand during a demonstration flight from the factory airfield at Marignane in the 40th production Ecureuil 2, registered F-GBON. After a short start-up routine, the helicopter was hover-taxied through a gate in the wire fence that divides the Aérospatiale airfield from Marseilles Airport's main runway, and was climbed smartly away heading northeast, levelling off at 3,000ft. Cruising at 120kts in hot (over 80°F), and windy conditions, the pilot demonstrated

Far left: Aérospatiale AS355F Ecureuil 2 (F-GBON) in close company with AS332B Super Puma demonstrator during a display at Farnborough 1982.

Left: The view from the cockpit of AS355F Ecureuil 2, F-GBON, during the author's demonstration flight over the South of France near Marignane.

Below left: An SA365N (Harbin 9) ordered by the Chinese AF with a Rumanian-built Alouette III awaiting delivery at Marignane.

Right: One of the 90 SA366G Dauphin 2s being built for the US Coast Guard on its assembly stand.



that the AS355F will fly with hands and feet off quite steadily for a few minutes despite the bumpy conditions. The TwinStar has recently been certified by the FAA for single-pilot operation in IFR conditions when equipped with the Sfim autopilot. Our course passed south of Aix-en-Provence to the 3,000ft Mt Ste Victoire, a rocky outcrop close to Pablo Picasso's villa, some 25 miles from Marignane. We then dived steeply at a speed of 150kts to a small ledge near the base of the mountain where we hovered and touched down on an area not much larger than the length of the aircraft before lifting off again into a 20ft hover where the pilot proceeded to show how controllable the Ecureuil was by flying sideways, backwards and turning on the spot in both directions followed by a vertical climb out during which one engine was cut. It wasn't until the pilot pointed out the engine revs winding down, that I had any indication that the helicopter was flying on a single engine. The high speed cruise (132kts) back to the factory was smooth and the excellent visibility from the front passenger seat enabled one to appreciate the Provence countryside below with the blue Mediterranean beyond. One engine was again cut during the descent and approach, which was flown at the single engine speed of 65kts, and the helicopter touched-down at Marignane after 45min flying time.

Twin-engine reliability plus corrosion resistant composite construction were key factors in the AS355's success in the US market, and in fact it was a request from one of its customers, Air Logistics of Louisiana, for a twin-engined version of the AS350, that led Aérospatiale to launch the TwinStar, 30 of which were subsequently ordered by Air Logistics.

March 1979 saw the first flight of what is rapidly becoming the flagship of Aérospatiale's range, the SA365 Dauphin 2, a composite constructed 10-14 seat commercial helicopter powered by two 700shp Arriel 1C turboshafts developed from the single-engined SA361 Dauphin that first flew in 1972. The SA365 is the second product of Aérospatiale's massive investment in composite technology in which conventional metal-nomex material is used only for the cabin and gear-box floors and the tail-boom. As with the AS355, no conventional jigs are used. The Kevlar cabin panels, nose cone and engine covers are built up around the few identical metal parts that have been cut and drilled by computor operated machines. The ducted tail-rotor unit, vertical stabiliser, main and tail-rotor blades are constructed out of carbon fibre as is the Starflex hub, swashplate, suspension arms, pitch control levers and the rotor mast. The patent Starflex is made up of layers of carbon fabric that have been cut to shape by a computor controlled laser-cutter, made in England, and bonded together in super-heated ovens. The suspension arms and rotor mast are produced of filament wound carbon ribbon that is heat-bonded and trimmed into shape. Initial orders for the Dauphin 2 came from the civil sector for the transport model — seven ordered by New York Helicopters — and executive models by such companies as FIAT (which produces Puma and Dauphin gearboxes for Aérospatiale), and the offshore oil-support aviation companies. A major order for 50 Dauphin 2s came from the air arm of the Chinese People's Army, where it is known as the Harbin 9, and is used for exploring and supporting China's newly developed oil-fields. Another vital and hard-fought order came from America when the US Coast Guard ordered 90 SA366Gs. This version involved a large number of complicated and costly modifications including the fitting of Avco-Lycoming LTS 101-750 engines, US instruments and avionics, and a lightweight hoist made of Kevlar and carbon-fibre. In view of the intense competition from the US helicopter manufacturers, both commerical and political, for the Coast Guard order, Aérospatiale consider all the effort and expense that went into the re-design of the SA366G well worthwhile; it has also helped with the development of a full scale military version for the Saudi-Arabian air force the AS365F. Twenty of the 24 Dauphin 2s ordered by the RSAF will operate from Frigates in an anti-shipping role equipped with folding rotor blades, Agrion radar and four AS15TT anti-ship missiles, while the remaining four helicopters are used in an SAR role fitted with Omera search radar and US Coast Guard type hoist. Five similar SAR models have been ordered by the Irish Air Corps, two of which will be fitted with Bendix radar and Sfim autopilot and operated from new fishery protection vessels. The SA365M also serves with the RAAF in a training and liaison role, and two are used by the Sri Lanka Air Force for surveying and transport.

With some six versions of the Dauphin in production, and an anti-tank derivative in the pipeline, the planned output of 16 per month of this extremely sophisticated composite constructed helicopter, more than 400 of which are on order, has been attained only a few months behind schedule.

Aérospatiale has entered the 1980s with a superb range of aircraft, a full order book and most important, a considerable lead in the use of composite technology over its main rivals.

LAST COMBAT

John Stanaway *recalls the last air combat of the Pacific Air War*

BY THE middle of 1945 the US Army 35th Fighter Squadron had established an enviable record in the Pacific based Fifth Air Force. A total of 125 Japanese aircraft had fallen to pilots of the squadron in combats ranging from Port Moresby through the Philippines and eventually the shores of Japan itself. Lt-Col Emmett 'Cyclone' Davis had commanded the 35th before he took charge of the entire parent 8th Fighter Group. Under his leadership the squadron commanded great respect among units of V Fighter Command in spite of the fact that the 35th used P-40s during a period when P-38 Lightnings were much in ascendancy. In point of fact, the 35th established a record for V Fighter Command squadrons when it claimed no fewer than 19 victories over Saidor, New Guinea on 16 January 1944 while suffering no losses.

When the 35th Fighter Squadron converted to P-38 type aircraft in the spring of 1944 its potential as an offensive unit became higher than ever. Unfortunately, Japanese air opposition in New Guinea collapsed before the squadron could prove its ability. The Philippines were invaded by American forces during the autumn of the year and a new period of aerial combat was experienced by V Fighter Command. Several new victories were claimed by the 35th before the entire Southwest Pacific seemed to be cleared of Japanese aircraft by the beginning of 1945.

Aerial combat was curtailed for the 35th while it was relegated to the ground-support role. In fact, after the breakdown of Japanese resistance in the Philippines early in the summer of 1945, there was little activity of any kind for many of V Fighter Command's units. There was little hope of proving its prowess with the P-38 and many of the skilled veterans of the 35th gratefully returned home after long tours throughout 1943, 1944 and into 1945.

But one last bit of action still remained for the last generation of 35th pilots in WW2. By the time the US had dropped the atomic bombs on Hiroshima and Nagasaki and the Russians entered the war against Japan, the 35th had moved to Plum Strip on Ie Shima island, just off the coast of Okinawa. The squadron was now within range of Japan itself, and the last bastions of Japanese airpower. One of the most effective elements of the waning Japanese airpower was the Ki-84 fighter, known as 'Frank' to the Allies. At least three units, the 47th, 101st and 102nd Sentai (squadron) faced the Americans in the direction of Okinawa. Daily combat patrols were required by these units to counter American incursions by free-ranging fighters and bombers. Young Japanese pilots had to learn the lessons of aerial warfare quickly but the exceptional speed and manoeuvrability of the Frank gave them every chance to survive and emerge victorious. It was a flight of Franks with young pilots from one of the above units that met the 35th Fighter Squadron in the last air battle fought by V Fighter Command in WW2.

It was mission number 226-B-9 or the 924th time that 35th Fighter Squadron aircraft were sent out against the Japanese in WW2. Seven P-38L5s were scheduled to escort a PBY Catalina flying-boat and a B-17 Fortress on a rescue patrol over the Inland Sea of Japan. The date of the mission was 14 August and the 35th pilots were briefed for take-off at 08.45hrs. Capt Raymond F. Meyer Jr was to lead the other six Lightnings on the cover and patrol mission. After two aircraft aborted during the flight to the rendezvous, the other five reformed to meet the rescue aircraft. Lt George Stevens was flying Meyer's wing along with Lt Dwight Hollister. Capt Billy Moore with Lt Duane Keiffer completed the formation. None of the pilots had ever been in combat before and, with the diminishing Japanese aerial presence, had little hope of ever finding contact with the enemy.

There wes considerable haze over the area when the 35th formation found the rescue aircraft. Letting down from an altitude of 17,000ft to about 12,500ft, the 35th pilots were fascinated by the PBY which was diverted from its primary mission to strafe a Japanese lugger that happened into the area. While the 35th pilots were centring their interest on the PBY they failed to notice the formation of six Franks approach them at high speed from the rear.

One indication that the Japanese pilots were inexperienced was that they chose to attack the P-38s first. It must have seemed a perfect opportunity to take the American fighter formation by surprise with a slightly numerically superior force. Japanese pilots with some first-hand knowledge of the P-38, however, would have realised that a more effective move would have been to divide their force in two, one segment making dive-and-zoom parry-thrusts to occupy the escort while the other despatched the Catalina and Fortress, using the speed of their dive to escape the American fighters which would have difficulty pursuing the Ki-84 fighters at minimum altitude. As it was, the Japanese fighters committed themselves with a high-speed run of about 325mph at the rear of the P-38 formation. Another indication of the inexperience of the Japanese pilots was that they overshot the American formation and failed to score a single hit. With their advantage gone the Japanese made a climbing turn to try and get back on the tails of the P-38s.

An excited Lt Hollister tried to warn the rest of his flight when he first sighted the Franks roaring overhead but in his haste jammed the R/T button and was unable to communicate. He quickly released his external tanks when he noticed the P-38s around him obviously reacting to the enemy presence by breaking to the left and to the right. Hollister turned with the No 3 Frank in the Japanese formation. Ordinarily, the P-38 would stand little chance of turning with any Japanese single-engine fighter, but this model of the P-38 that the Americans were flying was the L-5 with brand-new power-boosted controls and Hollister was just neophyte enough to try and tangle with a Frank in a turning dogfight. What Hollister did manage to accomplish was to face the Frank in a head-on firing pass. He opened fire when the Japanese fighter came into range and noticed strikes on the engine cowling and canopy. Pieces flew off and a small fire erupted beside the Frank's cockpit. As the Ki-84 rolled over and went down, the American pilot turned his P-38 tightly and came back into firing position. He fired twice more into the Frank's engine and it went into a spin and crashed into the sea.

When he first became aware the Franks were attacking his formation, Capt Meyer broke to the right with his wingman, Lt Stephens. Meyer reversed his turn as soon as he sighted one of the Japanese fighters manoeuvring for position on one of the P-38s. The Japanese saw Meyer arcing toward him and turned to face the American. When the two aircraft were coming together at about a range of 300yds, Meyer let go a burst which struck the Frank's cockpit, engine and wing. The P-38 leader pulled his fighter up to avoid a collision and looked back to see the Ki-84 burning from the wing and engine. This fighter followed the other Frank in a flaming spin into the sea. Meyer then observed another Frank on the tail of a P-38, about to open fire. He dived his Lightning and came up behind the Frank in time to save his fellow flight member. After a few bursts from the P-38's guns, the Frank rolled over and fell smoking into the sea. During this time Stevens also met one of the Franks in a head-on pass. After the two enemies roared by each other Stevens saw the Frank burst into flames and spin toward the sea.

Capt Moore and Lt Keiffer had attacked another Frank at an altitude of about 9,000ft and the Japanese tried to escape by rolling and diving for the ocean surface. Moore was able to stay with the gyrating Frank and Keiffer managed to generally keep up with his element leader. At about 3,000ft the Frank evidently thought better of it and made a break for the coastline. Moore was directly behind with throttle wide open, trying to close the gap and come into range. Keiffer was above the action when the Frank headed for possible help on the friendly shore. When he put his P-38 into a dive he built up speed at a terrific rate as he saw a chance to overtake the enemy. He came down quickly and was able to fire a short burst but was certainly horrified to discover that he had miscalculated and was shooting out ahead of his intended victim. The P-38 pulled ahead of the Japanese fighter and Keiffer pulled back desperately on the control column in an attempt to evade the fighter that he had been attacking only a moment before. Even though he was racing for his life from Moore's pursuing Lightning, the Japanese in the cockpit of the Frank instinctively took the opportunity to attack Keiffer's P-38. Ignoring Moore for the moment, the Japanese pilot turned his sights on Keiffer's fighter and put a burst into the right engine, setting it afire. Keiffer released the canopy-top on his P-38 but did not have enough altitude to take to his parachute before the fighter spun into the water. Moore then made short work of the Frank by shooting a part of its wing off. The Japanese pilot paid a heavy price for his victory when he went down with his fighter into the Inland Sea.

By this time the sixth Frank realised that he was all alone in the midst of a victorious enemy and became decidedly on the defensive. The Americans had been able to maintain some semblance of a formation and thus were in a position to make co-ordinated attacks on the remaining Japanese fighter. However, the Ki-84 finally showed its true potential. By using its excellent manoeuvrability near the water, the Japanese pilot made his Frank an extremely difficult target and forced the American pilots to attack from either directly ahead or dead astern. After about 30min of deadly manoeuvring, the Japanese pilot found himself in the clear and raced for the haven offered by the island of Shikoku. The P-38s pursued the Frank as long as they could but the fighter was much too fast at minimum altitude and the American fighters were low on fuel. After observing that some damage

Below: The Squadron Commander's P-38 of the US Army 35th Fighter Squadron at Tacloban strip in the Philippines; note that the right propeller has been feathered suggesting an emergency landing.
All photos via the author

Top left: A P-38 Lightning of the 35th's sister unit in 8th Fighter Group, 36th Fighter Squadron. In the background can be seen a P-47 Thunderbolt and a B-24 Liberator.

Centre left: Celebrating his Ki-84 kill, Lt Dwight E. Hollister stands alongside his P-38 after participating in the last air battle fought by V Fighter Command in WW2. The serial block on the aircraft shows it to be P-38L-5, 44-25167.
Photo: D. E. Hollister via the Author

Left: P-38Ls ('T' *Pattie* [left] and 'X' *Mary Jane*) of the 35th Fighter Squadron. The letter identities were moved from the centre fuselage to the outer cowling in early summer 1944 for easier recognition.

Left: The victorious four pilots of Capt Meyer's flight that shot down five KI-84 on 14 August 1945. From left to right the pilots are: Capt B. G Moore (1 kill); Capt R. F. Meyer (2 kills); Lt D. E. Hollister (1 kill); and Lt G. I. Stevens (1 kill). *Photo: Norbert Krane, via the author*

had been inflicted on the lone remaining Frank, the Americans turned for their home base. The last aerial combat for the V Fighter Command was over.

It has been said that there is no glory in being the last man killed in a war — only irony. While one may argue that there is no glory in being killed in battle at any time, there is a special poignancy in this last hostile meeting between Japanese and American airmen. Apparently both sides comprised young pilots uninitiated in the ways of aerial combat. Nearly every loss was attributable to inexperience. If the American flying-boat had not lingered to strafe the Japanese lugger or if the Japanese fighters had not selected that particular vector to fly (assuming they were not attracted by distress calls) then perhaps this final battle would never have been fought. But, such as it was, the last engagement between the Japanese and V Fighter Command was typical of 3½ years of conflict. Both sides suffered losses. In this case the Japanese losses were greater but at one time or another each contingent bore grievous casualties.

airmarks

Compiled by **Peter R. March**

CIVIL and military aircraft alike, the respective registers show constant changes. No sooner is the ink dry on a new edition of *Military Aircraft Markings* than a long list of new information on allocations, deletions and changes of unit becomes available. Responding to many requests from readers we will be providing henceforth a regular up-date to the current edition of *Military Aircraft Markings*, listing some of the new serials, aircraft lost to the UK scene and the more significant changes of unit and code letters. To begin, some additional UK-based aircraft; where an asterisk (*) is shown against a serial number this is a spurious marking, not having been genuinely allocated to that aircraft, although it is carried.

Serial	*Type (alternative identity)*	*Owner, Operator or Location*
A1325	RAF BE2e (fuselage)	Mosquito Aircraft Museum, Salisbury Hall, Herts
N4172	Fairey Albacore	FAA Museum, St Just (on rebuild)
KG374*	Douglas Dakota 3 (TS423, G-DAKS, G-AGHY)	Aces High, Duxford
TK777	GAL Hamilcar (fuselage)	Museum of Army Flying, Middle Wallop
WB440	Fairey Firefly AS6 (cockpit)	Manchester Air & Space Museum
XV555*	HS Harrier GR1 (XV279, 8566M)	RAF Wittering, instructional use
ZB507	Westland Sea King Mk4RAE	MoD(PE) RAE Bedford
ZD255	Westland Lynx HAS3	RNAS Portland
ZD256	Westland Lynx HAS3	RNAS Portland
ZD257	Westland Lynx HAS3	RNAS Portland
ZD258	Westland Lynx HAS3	RNAS Portland
ZD272	Westland Lynx AH1	MoD(PE) for Army Air Corps
ZD273	Westland Lynx AH1	MoD(PE) for Army Air Corps
ZD274	Westland Lynx AH1	MoD(PE) for Army Air Corps
ZD275	Westland Lynx AH1	MoD(PE) for Army Air Corps
ZD276	Westland Lynx AH1	MoD(PE) for Army Air Corps
ZD277	Westland Lynx AH1	MoD(PE) for Army Air Corps
ZD278	Westland Lynx AH1	MoD(PE) for Army Air Corps
ZD279	Westland Lynx AH1	MoD(PE) for Army Air Corps
ZD280	Westland Lynx AH1	MoD(PE) for Army Air Corps
ZD281	Westland Lynx AH1	MoD(PE) for Army Air Corps
ZD282	Westland Lynx AH1	MoD(PE) for Army Air Corps
ZD283	Westland Lynx AH1	MoD(PE) for Army Air Corps
ZD284	Westland Lynx AH1	MoD(PE) for Army Air Corps
ZD285	Westland Lynx AH1	MoD(PE) for Army Air Corps
ZD286	Westland Lynx AH1	MoD(PE) for Army Air Corps
ZD485	FMA IA58 Pucara (A-515)	MoD(PE) A&AEE Boscombe Down
ZD486	FMA IA58 Pucara (A-533)	MoD(PE) A&AEE Boscombe Down
ZD487	FMA IA58 Pucara (A-549)	MoD(PE) A&AEE Boscombe Down
ZD620	BAe 125 CC3	RAF No 32 Sqn, Northolt
ZD621	BAe 125 CC3	RAF No 32 Sqn, Northolt
ZD695	BAe 146 CC1	MoD(PE) for RAF
ZD696	BAe 146 CC1	MoD(PE) for RAF
ZD703	BAe 125 CC3	RAF No 32 Sqn, Northolt
ZD704	BAe 125 CC3	RAF No 32 Sqn, Northolt
ZD948	Lockheed TriStar KC1 (G-BFCA)	MoD(PE) for RAF
ZD949	Lockheed TriStar KC1 (G-BFCB)	MoD(PE) for RAF
ZD950	Lockheed TriStar KC1 (G-BFCC)	MoD(PE) for RAF
ZD951	Lockheed TriStar KC1 (G-BFCD)	MoD(PE) for RAF
ZD952	Lockheed TriStar KC1 (G-BFCE)	MoD(PE) for RAF
ZD953	Lockheed TriStar KC1 (G-BFCF)	MoD(PE) for RAF
483621	Sturgeonair Mustang (G-BEFU)	Privately owned, Coventry
80-1068	Lockheed TR1A	USAF 95RS/17RW, RAF Alconbury
80-1070	Lockheed TR1A	USAF 95RS/17RW, RAF Alconbury
IN601	BAe Sea Harrier FRS51	Indian Navy Sea Harrier Training Unit, RNAS Yeovilton
IN602	BAe Sea Harrier FRS51	Indian Navy Sea Harrier Training Unit, RNAS Yeovilton
IN603	BAe Sea Harrier FRS51	Indian Navy Sea Harrier Training Unit, RNAS Yeovilton
IN604	BAe Sea Harrier FRS51	Indian Navy Sea Harrier Training Unit, RNAS Yeovilton
IN605	BAe Sea Harrier FRS51	Indian Navy Sea Harrier Training Unit, RNAS Yeovilton
IN606	BAe Sea Harrier FRS51	Indian Navy Sea Harrier Training Unit, RNAS Yeovilton
IN621	BAe Harrier T52	Indian Navy Sea Harrier Training Unit, RNAS Yeovilton
IN622	BAe Harrier T52	Indian Navy Sea Harrier Training Unit, RNAS Yeovilton

continued from page 348

choice in 1968 was once again Boscombe Down. In open country and with long runways Boscombe offers a much less restricted operating environment and is 50 miles nearer to the Channel supersonic corridor. Like the test pilot schools in France and the United States, ETPS now has all the advantages of being within its Service Flight Test Centre with comprehensive technical backing and a wide variety of aircraft types. As the majority of British test pilots carry out their three year test flying tour at Boscombe Down, there is a wealth of experience to be tapped by the students.

airevents '83

It is sad to report two fatal accidents at UK air-shows during May. At the Manchester Air Show at Barton on 15 May the Replica Mustang G-BEFU crashed during an aerobatic routine. Two weeks later at Mildenhall the Beech T-34C Turbo Mentor N2067A flew into the ground after completing a loop. The pilots of both aircraft and a passenger in the T-34 were all killed. In neither accident were any spectators injured probably because the aircraft were both flying on a display axis which kept them well clear of the crowd line. The crash of a Canadian Forces F-104 at a show in Sollingen in West Germany has grounded the CAF Starfighter display team for the rest of the year.

The Western Region BBAC Hot-air Balloon Meet at Skenfrith on 21-22 May was attended by some two dozen craft. Of particular interest was the 1793 Montgolfier replica just completed by Don Cameron for a Belgian customer. Unfortunately conditions were not calm enough for the maiden flight to be effected, this being achieved the following day back at Bristol. Representing the other end of the 200 years of

Below: First flight of the Cameron Montgolfier Hot-air balloon replica at Ashton Park, Bristol on 23 May. *Photo: Peter R. March*

manned flight, the apppearance of the piggy-backed shuttle *Enterprise* on NASA 747 N905NA brought out huge crowds. Over 15,000 people crowded into Fairford on 20 May for the one-hour refuelling stop-over en route to the Paris Air Show. Ten times that number thronged Stansted on 5-7 June for the official visit on its way back to the USA. And what an impressive sight this combination made, whether on the ground or making a sweep across London, Birmingham or Manchester as it headed for Iceland and the long haul over the Atlantic.

Although the Shuttle was not on display at the USAF's Air Fete 83 at Mildenhall on 28-29 there was a good deal of American hardware on view. This included a Lockheed SR-71 on static show, KC-10 Extender and for the first time a flying demonstration by a Lockheed TR-1 from Alconbury. The US Navy made a welcome re-appearance with an F-14 and P-3C, together with a support C-1A Trader 146028. Not to be outdone the RAF was well represented with a unique line-up of training aircraft, a trio of Tornados and a pair of Vulcans — a K2 in the static line and a B2 in the flying programme. But for many of the visitors the star in the static display was the Royal Hellenic Air Force TA-7 Corsair 161222. The weather handicapped the flying programme on the first day, but most of it was completed before low cloud and drizzle swept in. Following their appearance at the Biggin Hill Air Fair, the Warbird Circus of Stephen Grey's Bearcat, Wildcat and Mustang together with Lindsey Walton's Corsair gave a lively display as did Aces High's newly painted T-33 and Dakota G-DAKS/KG374, the latter making its debut

Top: First appearance of a Greek TA-7 Corsair in the UK was 161222 at Mildenhall for the Air Fete '83.

Above: A No 22 Squadron Wessex HAR2 giving its display at RAF Chivenor on 2 June — in the foreground is a line-up of civilian participants. *Photos: Peter R. March*

since being transformed from 'G-AGHY' of Ruskin Air Services. Another new paint scheme came with the CAF 'Redskins' F-104 Starfighter which had been part of the 1983 display team. With a red fuselage and white markings it is certainly very eye catching. 1983 has all the makings of being the year for novel markings on front-line aircraft. The next to appear will be Phantoms at Greenham Common with special colour schemes to mark the 25th anniversary of the F-4's first flight.

A handful of Vintage Aircraft Club aircraft attended the Spring Camp at Shobdon during the Bank Holiday weekend. The most significant of these was probably the scarlet Comper Swift G-ACTF. A new vintage resident was Aeronca L-3 27767/G-BIHW which had been in the Duxford sale. Air Compton's Tea Dance Fly-in at Compton Abbas also attracted a number of vintage aircraft amongst the 50 or so visitors, including the two Moths G-AAMY and G-ABEV, newly restored Tiger Moth G-AFVE, Stinson 108 G-BHMR, Stampe G-AZCB and Autocar G-AOFM.

The Open Day at RAF Chivenor on 2 June turned out to be a much bigger event than originally envisaged, having grown from being a

local Civic Day, with admission by invitation/ticket only, to being a full-scale Open Day with a large static display and a flying programme which lasted for more than five hours. Not unexpectedly Hawks were much in evidence with 18 aircraft from Nos 65 and 151 Squadrons on the flight line, augmented by the 'Red Arrows' who gave their first UK display after returning from the US. The TWU's first Hawk equipped to fire Sidewinder missiles, XX219, of No 63 Squadron was on show in the hangar display. Also in the static display was a trio from Boscombe Down, ETPS Jaguar T2 XX915, Scout XP849 and Harvard KF183 along with a Hunter from Brawdy, Tornado ZA405 from Honington and a host of other RAF machines. The flying display included spectacular attacks by Jaguars, Hawks and Hunters on the airfield together with more gentle performances from a Pilatus P2, Gemini, Stampe, Zlin Z-50 and several Pitts. In the bright Devon sunshine the Chivenor Air Day brought back memories of the big international events held in the early 1970s.

By previous standards this year's Prestwick Air Show on 4 June was a very modest event. A Tornado appeared for the first time on the ground, although neither of the two aircraft (ZA368 and ZA562) were positioned in the static display. Best flying came from the F-15A Eagle and A-10A Thunderbolt, there being three examples of each type present. Dominating the proceedings was C-5A 00460, while Sea Harriers XZ458 and XZ460 attracted a good deal of interest.

There was a rare opportunity for invited guests to see one aspect of the flying side of Boscombe Down on 11 June when the ETPS held its 40th anniversary reunion. A static display of ETPS aircraft occupied Hangar 1, including Wessex HU5 XS509, Hunter T7 XL564, Jaguar GR1 XX119, T2 XX915, Gazelle XZ936, Jet Provost T5 XS230, Hawk T1 XX343, Basset CC1 XS743 and Sikorsky SH3D XV370. Outside was Andover C1 XS606. A flying display lasting nearly three hours entertained the visitors and the large number of spectators gathered outside the airfield. Highlights were undoubtedly the demonstrations given by the Pucara ZD485, RDAF F-16A E-192, and ETPS Lightning T5 XS422. Twelve types of aircraft that have served with the ETPS since 1943 featured in the flying, from Anson WD413 to Lancaster PA474.

There was a tremendous support for the two big public events held on Sunday 12 June. At RAF Cosford the Open Day had the usual bonus of the Aerospace Museum to provide one of the biggest and most varied static displays to be seen at an air show in this country. Relative newcomers to the museum collection included former Dutch Navy Neptune 204/V, Trident G-ARPH, Vulcan B2 XM598 and ex-Argentine Pucara A-528. Meteor NF14 WS838 had returned from

Above: A unique sight at the ETPS 40th anniversary celebrations on 11 June — Pucara ZD485 flown by an A&AEE crew.
Photo: Peter R. March

Manchester as it was not required for the new museum. The other big holder of interesting retired aircraft, No 2 School of Technical Training, also had many of its aircraft on show, including a number of recent arrivals such as Canberra T17 WK102, Hunter T7 XL623 and Canberra PR9 XH171. The flying display had the usual mix of current RAF aircraft and civilian items such as the B-17 'Sally B', Pilatus P2 and Ryan PT23. The major surprise at the annual SSAFA Air Display at Church Fenton was the big support given to the event by Jordan, with C-130, F-5s, Pitts and Islander in the programme. A very different event, also held on 12 June, was the 2nd Swansea Fly-in held at Fairwood Common. Some 40 aircraft battled against a fresh westerly wind to attend. Jodel G-BICR took no less than 2¼hr to reach the south-west Wales airfield from Redhill. Vari-Eze F-PYKJ took much less time to travel from Biggin Hill in the hands of its new British owner. Local residents of special interest were the Belfair G-APIE, Fred G-RONW and Rand KR2 G-BKFV.

Looking ahead to the events over the coming weeks there is a tremendous variety to choose from. The major show is of course the International Air Tattoo at Greenham Common on 23-24 July, which is previewed separately. Staying with the military scene there are the main Fleet Air Arm displays at Lee-on-Solent, Culdrose and Portland, RAF Open Days at Brawdy, St Mawgan and Valley and USAF displays at Fairford, Wethersfield and Upper Heyford. One of Shuttleworth's four main displays of the year, the Military Pageant comes up on 31 July, while an air pageant of a different sort will be presented at Bournemouth-Hurn on 17 July. On the same date the Badminton Air Day will include a wide range of mainly piston engined aircraft spanning 70 years of flying from the First World War to the present day. The Air Day will conclude with a hot-air balloon race sponsored by the Post Office; a similar event last year attracted more than 30 balloons. And if you think you are away from it all at the seaside, be warned, the 'Red Arrows' begin their round of coastal displays at Brighton on 22 July.

Readers are reminded that some of the events listed below may not be open to the public. It is usual for RAF Families Days and Reunions to be restricted to invited guests only. You are advised to check that any event you plan to visit is taking place on the day and at the venue expected before you set out.

airevents 83

July

9-17 Booker, Bucks: Regional Gliding Competition (Tel: 0533 531051)
10 Strathallan, Auchterarder, Tayside: Flying Day (Tel: 07646 2545)
10 Essex Showground, Chelmsford, Essex: St John Gala
10 Duxford, Cambs: Air Britain Fly-in & 50th Bucker Anniversary (Tel: 049481 3404)
10 RAF Cranwell, Sleaford, Lincs: RAF Open Day and City & Guilds Trophy National Air Race (Tel: 0400 61201)
10 Middle Wallop, Hants: Wallop Vintage Rally, Museum of Army Flying (Tel: 0264 62121)
10 Fenland Airfield, Norfolk: Strawberry Fly-in (Tel: 0945 582891)
10 Popham, near Winchester, Hants: Biplane Fly-in, Recreational Flying Club (Tel: 025675 733)
10 Salisbury Hall, London Colney, Herts: Mosquito Aircraft Museum Open Day (Tel: 0727 23274)
10 Sherburn-in-Elmet, North Yorks: Aero Club Lunch Patrol (Tel: 0977 682674)
16 HMS *Daedalus*, RNAS Lee-on-Solent, Hants: RN Air Day (Tel: 0705 550143 ext 137)
16 RAF Wyton, Huntingdon, Cambs: RAF Open Day (Tel: 0480 52451 ext 431)
16 Silverstone, Northants: British Grand Prix
16-17 Portland Naval Base, Dorset: Portland Open Days (Tel: 0305 820311 ext 2379)
16-17 Weston Park, Salop: Microlight Fly-in (Tel: 065477 235)
17 RAF Fairford, Cirencester, Glos: USAF Open Day (Tel: 0285 712511)
17 Gravesend, Kent: Gravesend Round Table Air Spectacular
17 Weston Park, Salop: Air Display (Tel: 095276 207)
17 Old Warden, Beds: Shuttleworth Veteran Aeroplane Society Model Day (Tel: 076727 288)
17 Badminton, Avon: Badminton Air Day & Hot-air Balloon Meet (Tel: 045421 379)
17 Bournemouth-Hurn, Dorset: Bournemouth Air Pageant (Tel: 09594 72277)
21 RAF Brawdy, Haverfordwest, Dyfed: RAF Open Day (Tel: 0437 4571 ext 202)
22 Eastbourne, East Sussex: RAFA Air Show (Tel: 0323 23551)
22 Brighton Sea Front, East Sussex: Red Arrows Display
23 Prestwick, Strathclyde: British Aerospace Open Day
23 Folkestone Sea Front, Kent: Red Arrows Display
23-24 RAF Greenham Common, Newbury, Berks: International Air Tattoo 83 (Tel: 0635 30060)
23-24 Oakington, Cambs: Auster Fly-in Weekend, International Auster Pilot Club (Tel: 061236 3377 ext 494)
23-31 Lasham, Hants: Open National Gliding Championships (Tel: 0533 531051)
23-31 Sutton Bank, Yorks: Northern Regional Gliding Competition (Tel: 0533 531051)
24 Norwich Airport, Norfolk: Aero Club Fly-in (Tel: 036 283274)
24 Lyme Regis Sea Front, Dorset: Red Arrows Display
24 Shobdon, Hereford & Worcs: Grosvenor Challenge Trophy National Air Race (Tel: 07073 20303)
26 RAF Odiham, Hants: Families Day
27 HMS *Seahawk*, RNAS Culdrose, Helston, Cornwall: RN Air Day (Tel: 03265 4121 ext 2460)
28 Llandudno Sea Front, Gwynedd: Red Arrows Display
30 RAF Wethersfield, Great Dunmow, Essex: International Air Pageant (Tel: 0371 850317)
30 RAF Wittering, Cambs: Families Day
30-31 RAF Cosford, Wolverhampton, West Midlands: Aerobatic Competition (Tel: 024368 3263)
31 Staverton nr Cheltenham, Glos: Gloster Aero Group Motor Glider Fly-in
31 Old Warden, Beds: Shuttleworth Military Air Pageant (Tel: 076727 288)
31 Bodmin, Cornwall: Cornwall Flying Club Air Day (Tel: 020882 288)

August

2-11 RAF Henlow, Beds: Inter-Services Gliding Competition (Tel: 0533 531051)
4 Weston-super-Mare Sea Front, Avon: Great Weston Air Day (Tel: 0934 24763)
5-7 Newtownards, Co Down, Northern Ireland: Ulster International Air Rally (Tel: 0247 813327)
5-7 Abbeyshrule, Co Longford, Eire: Air Rally (Tel: Abbeyshrule 5459)
6 Bournemouth Sea Front, Dorset: Red Arrows Display
6-7 Holker Hall, Yorks: Hot-air Balloon Meet (Tel: 0225 834686)
7 Duxford, Cambs: Imperial War Museum Military Show (Tel: 0223 833963)
7 Abbeyshrule, Co Longford, Eire: Air Display (Tel: Abbeyshrule 5459)
10 RAF St Mawgan, Newquay, Cornwall: International Air Day (Tel: 06373 2201 ext 323)
12-14 Ashton Park, Bristol, Avon: Bristol International Balloon Fiesta '200' (Tel: 0272 823611)
12 White Waltham, Berks: NATFLY '83 Fly-in (Tel: 06285 20349)
13 RAF Valley, Holyhead, Anglesey, Gwynedd: RAF Open Day (Tel: 0407 2241 ext 314)
13 RAF Upper Heyford, Oxford: USAF Open Day (Tel: 086982 2331)
13-14 Barton, Manchester: 1930s Style Fly-in and Garden Party (Tel: 0270 623930)
13-21 Husbands Bosworth, Leics: Standard National Gliding Championships (Tel: 0533 531051)
14 Ashton Park, Bristol, Avon: Festival of Flight (Tel: 0272 297676)
14 Popham, near Winchester, Hants: Miller Memorial Auster Fly-in (Tel: 025675 733)
14 Coventry, Warks: RAFA Air Display (Tel: 021449 3007)
14 Jurby, Isle of Man: RAFA Air Display
17 Weymouth Sea Front, Dorset: Red Arrows Display
17 Cromer Sea Front, Norfolk: Red Arrows Display
17 Longleat House, Warminster, Wilts: BBAC International Balloon Meet (Tel: 0225 834686)
19 Southport Sea Front, Lancs: Red Arrows Display
19-20 Casement, Dublin, Eire: Fitzmaurice Memorial Rally (Tel: Dublin 515073)
20 Whitby Sea Front, North Yorks: Red Arrows Display
21 Old Warden, Beds: Vintage Sports Car Club Rally & Flying Afternoon (Tel: 076727 288)
21 Rochester, Kent: Air Show and Kent Messenger Air Race (Tel: 0795 72926)
21 Faireyhouse Racecourse, Co Meath, Eire: Air Spectacular 83 (Tel: Dublin 379900)
21 Castle Mill Strip, Beds: Auster Fly-in, International Auster Pilot Club
24 Broadstairs, Kent: Red Arrows Display
25 Sidmouth Sea Front, Devon: Red Arrows Display
25 Kingscliffe, Northants: Kingscliffe Airfield Memorial Event
26 Dartmouth, Devon, Red Arrows Display
26-27 East Midlands: European Federation of Women Pilots Fly-in
27 Teesside Airport, Middlesbrough, Cleveland: Air Show (Tel: 0325 332811)
27-29 Crich, Derbyshire: Crich Transport Extravaganza
27-29 HM Dockyard, Portsmouth, Hants: Navy Days (Tel: 0705 22351 ext 22583)
27-29 HM Dockyard, Plymouth, Devon: Navy Days (Tel: 0752 53777 ext 220)
27-29 Popham, near Winchester, Hants: Microlight Weekend (Tel: 025675 733)
27-4 September: Enstone, Oxon: Regional Gliding Competition (Tel: 0533 531051)
28 Old Warden, Beds: Shuttleworth Collection, Holiday Flying Display (Tel: 076727 288)
28 Leicester Airport, Leics: Leicestershire International Air Display (Tel: 053759 3484)
28 Carlisle, Cumbria: Flying Club Fly-in (Tel: 022 873629)
28-29 Essex Showground, Great Leighs, Chelmsford, Essex: Essex Air Show (Tel: 0279 813237)
29 Halfpenny Green, Bobbington, West Midlands: Air Display (Tel: 0602 815050)
29 Compton Abbas, Dorset: Bank Holiday Lunchtime Barbeque Fly-in (Tel: 0747 811767)
29 Oulton Broad, Norfolk: Red Arrows Display

Euro-airevents 83

The following list shows some of the air events reported to be taking place in Western Europe during the next few weeks. As with the UK air shows you are advised to check carefully before setting out for an event that it is taking place on the date and at the location shown for it. Neither the editors nor the publishers of *Aircraft Illustrated* can be held responsible for the accuracy of the published lists.

July

9-10 Regional RSA Rally, Villeneuve sur Lot, France
9-10 *Noordzeeluchvaartsux-Merignac*, France
21 Air Rally, Augsburg, West Germany
22 *Tage der Offene Tur der Luftwaffe*, Lechfeld, West Germany
23-24 3rd Aviation Festival, Meribel, France
24 *Flugtag*, Bamberg, West Germany
27 Flying display, Imatra, Finland
28-31 RSA (French Home-built Association) Fly-in, Brienne le Chateau
31 *Internationale Vliegmeeting*, Leopoldsburg/Hechtel, Belgium

August

1-6 *Deutsche Motorkunstflug-Meisterschaften*, Munster-Osnabruck, West Germany
4-6 *Open Duren Dagen*, Koksijde, Belgium
6 Air Display, Dinan-Trelivan, France
7 USAFE Open Day, Ramstein, West Germany
7 *Flugtag*, Genf, Switzerland
8-13 World Precision Flying Championships, Skien, Norway
13 *Vliegfeest*, Texel, Holland
13-14 Homebuilt Fly-in, Sion, Switzerland
13-14 USAFE Open Day, Hahn, West Germany
13-15 International Fly-in, Schaffen/Diest, Belgium
14 *Flugtag*, Zeltweg, Austria
14 Air Show, Arvika, Sweden
14 *Bundesmarine Tag der Offenen Tur*, Eggebeck, West Germany
18-21 Air 83 — International Meet of Air Force Aerobatic Teams, Linz, Austria
19-29 European Aerobatic Championships, Ravenna, Italy
20 USAFE Open Day, Zweibrucken, West Germany
21 *International Vliegmeeting*, Keiheuvel, Belgium
21 *International Vliegmeeting*, Moorsele, Belgium
21 Flying Display, Helsinki, Finland
26-7 September: 6th World Hot Air Balloon Championships, Nantes, France
27-28 International Air Show, Bex, Switzerland
28 Royal Swedish Air Force Air Show, Uppsala-Sundbro, Sweden
28 USAFE Open Day, Sembach, West Germany
31 USAF Open House, Bitburg, West Germany
31 USAF Open House, Spangdahlem, West Germany

August

1-6 *Deutsche Motorkunstflug-Meisterschaften*, Munster-Osnabruck, West Germany
4-6 *Open Duren Dagen*, Koksijde, Belgium
6 Air Display, Dinan-Trelivan, France
7 USAFE Open Day, Ramstein, West Germany
7 *Flugtag*, Genf, Switzerland
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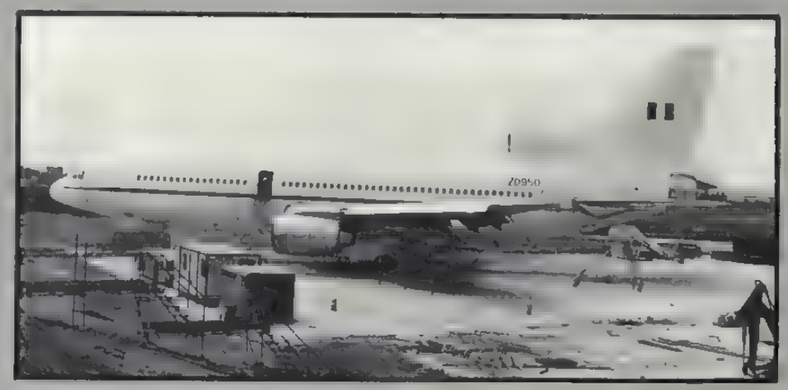
20 USAFE Open Day, Zweibrucken, West Germany
21 *International Vliegmeeting*, Keiheuvel, Belgium
21 *International Vliegmeeting*, Moorsele, Belgium
21 Flying Display, Helsinki, Finland
26-7 September: 6th World Hot Air Balloon Championships, Nantes, France
27-28 International Air Show, Bex, Switzerland
28 Royal Swedish Air Force Air Show, Uppsala-Sundbro, Sweden
28 USAFE Open Day, Sembach, West Germany

For this month's contributions we would like to thank: A. J. Brown, D. Conway, J. R. Cross, W. Gandy, P. Gingell, J. Guthrie, T. Hefferman, A. P. March, J. S. Mines, R. Rudhall, E. A. Shackleton, R. Wright and 'Whirlybird'. Also the publications *Air North, Air Scotland, Aviation Ireland, British Aviation Review, Cotswold Messenger, Flightpath, Hawkeye, Humberside Air Review, International Air Show Guide 1983, Irish Air Letter, Prestwick Airport Letter, Scottish Air News, Skyward, South West Aviation News* and *Stansted Aviation Newsletter.*

Below: ZD950 is the first TriStar to appear in RAF markings, seen here outside the new Marshall's hangar at Cambridge airport. It is ex-G-BFCC and is the second of the fleet to arrive at Cambridge for conversion.
Photo: J. D. R. Rawlings



Left: Spitfire AR213, one of 10 expected at the International Air Tattoo 83 to pay tribute to the late Sir Douglas Bader.

Below left: The Martini-Racing Team of three SIAI SF260s (I-APAA, 'PAB, 'PAC) shown here at the Paris Air Show, will make their UK debut at IAT 83 on 23-24 July.

Bottom: The C-5A Galaxy of the US Air Force dominated the static park during the 1981 Tattoo. *Photos: Peter R. March*

PREVIEW

Peter R. March

International Air Tattoo 83

RAF GREENHAM COMMON

Newbury, Berks 23/24 July

BY any standard the biennial air show at RAF Greenham Common is now established as one of the world's major air spectaculars, and this year's event on 23-24 July looks set to repeat the success of previous years. Well over 300 aircraft are scheduled to take part in the daily 8-hr flying programme and extensive static displays, coming from over 20 different air arms world-wide together with a host of interesting civil aircraft ranging from an airliner to airships and warbirds.

The first Air Tattoo was held at North Weald in May 1971 under the auspices of the RAF Association. The event became truly international in 1972 with participation from NATO and other overseas air arms. By now it had outgrown the former Battle of Britain airfield which was under threat from an advancing motorway and a new venue was found at Greenham Common for the 1973 Embassy Air Tattoo. The airfield was, at that time, a NATO standby base operated by the 7551st Combat Support Group under the control of HQ 3rd Air Force USAFE. The growing air show was repeated in 1974 but a Tattoo planned for 1975 was cancelled in the face of that year's fuel shortages and other organisational problems.

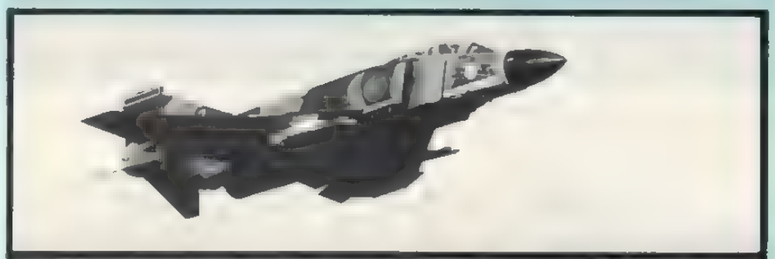
The team of volunteers who had developed the successful air tattoo concept, led by air traffic controllers Paul Bowen and Tim Prince, were not to be detracted from their aim of presenting the world's best military air show and managed to secure the backing of the RAF Benevolent Fund to stage International Air Tattoo 76. Introduced at this event was the special 'theme' or meet. To mark the 25th anniversary of the first flight of the Hawker Hunter a line-up of 25 of these famous fighters, including the prototype, were presented. In subsequent years the IAT included a Tiger Meet — NATO squadrons with a tiger in their badge (1977), the Lockheed C-130 Hercules (1979) and maritime aircraft in Sea Search '81. For this year's tattoo the 25th anniversary of the F-4 Phantom's first flight will be marked. It is planned to have a line-up of at least 25 F-4s including one from each RAF squadron and No 228 OCU, two from each West German Air Force Phantom squadron, a selection of four marks of F-4 from USAFE squadrons and a pair of F-4Js from the USS *Coral Sea*. Heading the line-up will be a pre-production aircraft from A&AEE Boscombe Down which has been specially decorated to mark the occasion.

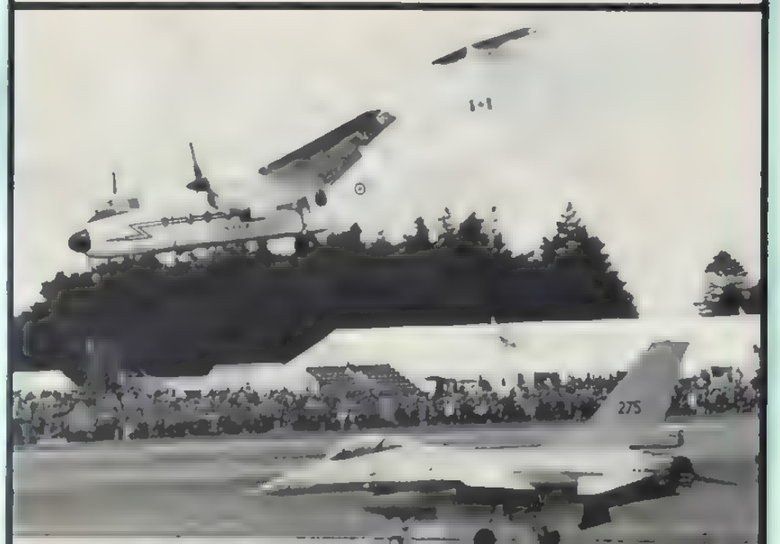
In 1976 the late Sir Douglas Bader accepted the RAF Benevolent Fund's invitation to take the presidency of International Air Tattoo. As figurehead he brought his own indomitable style to the proceedings, making his mark at each event which he attended throughout. His untimely death last autumn, shortly after the 1983 tattoo was announced, was a sad loss to the organising committee. To mark the significant contribution he had made to the RAF Benevolent Fund it was decided to pay special tribute to Sir Douglas at IAT 83. There will be a special half-hour display during the afternoon which will include as many Spitfires as can be mustered (the organisers are hoping for 10) for formation flypasts and solo aerobatics, and a Hurricane — Sir Douglas' favourite aircraft.

The flying display will begin at 10.00hrs each day, but if weather permits there will also be tethered hot-air balloons on show before this. Highlights of the flying will include the majority of Europe's jet aerobatic teams coming together for the only time this year, with the *Frecce Tricolori* from Italy demonstrating its new Macchi MB339s for the first time in the UK. The Royal Jordanian Air Force will be making a return visit, this time with Mirage F-1s. Naval air arms are well represented by the French and Germans as well as our own Fleet Air Arm. Types new to the IAT flying programme this year include the Fiat G222, Agusta 109, Lockheed TR-1, F4U Corsair and Douglas DC-9 Super 80. A civilian aerobatic team making its debut will be the *Patrouille Martini Racing* from Italy with its three SIAI SF260s. Yet another unique feature will be the appearance of two airships, the Goodyear 'Europa' and Skyship 500 from Airship Industries. The mammoth flying display which also includes major participation from the RAF and USAF, concludes at 18.00hrs, to be followed by further hot-air balloon flying.

Alongside the 25-plus Phantoms, the static display of aircraft will be the biggest yet seen at Greenham Common. Every type in the RAF's inventory, including the Vulcan K2 will be on show, while the USAF hopes to present all of its European-based types including the Lockheed SR-71, and a number of types such as FB-111 and B-52 flown over from the USA. The US Air National Guard will show EC-130H, C-130D, A-7D Corsair and a re-engined KC-135E. There will be a welcome return by the US Navy with several P-3 Orions, E-2C Hawkeye, A-6 Intruder and A-7 Corsair. Newcomers to Greenham's static park should include French Army Puma and Gazelle, Indian Navy Sea Harrier, Italian Air Force PD-808 and MB-339, NATO E-3B AWACS, RNZAF Boeing 727, Chilean Air Force C-130, US Army UH-60 Blackhawk, USAF F-16, Pilatus P-2, Broussard and Fairchild Argus. A special section will be devoted to a display of aircraft from the Empire Test Pilots School at Boscombe Down, which has recently celebrated the 40th anniversary of its formation. Types to be shown include Hawk, Jaguar, Wessex, Andover, Sea King and Hunter. Other A&AEE aircraft scheduled for the static display are Comet, Argosy, Sea Fury, Dakota and Pucara. As usual there will be a number of late surprises in the line-up.

If you want to have a break from the aircraft there will be the customary arena entertainment twice daily featuring bands, the White Helmets Motorcycle Display Team and a 30-minute Royal Marine Commando demonstration. An extensive exhibition will include exhibits from the aviation industry, displays by the Services, a special aviation enthusiasts' section and a shopping arcade. Altogether IAT 83 will be the biggest event of its kind so far organised by the volunteer team working on behalf of the RAF Benevolent Fund. All of the proceeds from the Tattoo will go towards the huge £4million expenditure in 1982 incurred by the Fund in relief of distress particularly amongst widows and the disabled.





Above left: Phantoms, like this aircraft from No 111 Squadron, will be much in evidence at IAT 83. *Photo: Andrew March*

Left: A RNorAF F-16 waits on the taxiway while a Canadian Forces Buffalo completes its flying display at IAT 81. *Photo: Peter R. March*

How to get there

By road

RAF Greenham Common is situated four miles south of Newbury, Berks — with easy access from the M4. The organisers have improved car access so that delays are kept to a minimum and the Thames Valley police are once again using a colour coded route system to speed the traffic flow.

From the East and London: M4 — leave at Junction 12 (Theale) — A4 to Midgham — follow the *RED* route in.

From the South and South-West: By A34 and A339 — follow the *GREEN* route in.

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By rail

An aerial view of Greenham on IAT days usually features bumper to bumper traffic for miles around. There is a much easier way to get straight to and from the airfield.

Just below Greenham in the Kennet Valley stands Newbury Racecourse station which is open for the show on both days. British Rail is running a programme of through trains which link with a frequent bus shuttle between the racecourse and the airshow. The energetic could walk up the hill from the station but the bus link is the best way and it takes you right to the public enclosure.

By coach

Alder Valley buses will once again operate a frequent shuttle bus service from Newbury Racecourse Station and Newbury Bus Station to the airfield. This service will operate throughout the day. The fares will be £1 return/50p single for adults, and 50p return/25p single for children.

A special coach service will operate from London Victoria Coach Station leaving at 07.00hrs and 09.00hrs and returning 18.00hrs. The return fare, including admission is £7.50 adults and £3.15 children. Seats are bookable in advance from National Travel agents.

Information

Car park opens	07.00hrs
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Exhibition and Fairs close	19.30hrs
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Admission charges

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SHUTTLE FEVER

Alan Wright

AT ITS 10.00hrs scheduled time of departure on 7 June, Boeing 747-123 N905NA began to roll down Stansted's runway 23 carrying the Orbiter *Enterprise* back to the US. There were feelings of relief and satisfaction on the ground that the three day visit had been so successful. The event certainly caught the imagination of the public, who turned out in their hundreds of thousands.

Despite the incredible technical achievements of the American Space Shuttles, after the first few uneventful trips the flights became somewhat routine with but brief mention by the media. However, a personal appearance was guaranteed to provoke enthusiasm which is just what happened at Stansted on 5 June.

Expected at 14.45hrs, the 747 and its passenger was delayed an hour because of bad weather in the south of England. The almost carnival atmosphere at its destination continued in the warm sunshine. Even the objectors to London's third airport conveniently forgot their objections having found a useful source of income for the repair of a church roof or two by selling home made buns. The stars of the occasion made their entrance with a low pass along the runway. The combination is able to cope with a 10kt tailwind for landing, but since the strength marginally exceeded this figure, a 180-degree turn was made for an immaculate 05 touchdown.

It presented an impressive sight as it slowly taxied around the perimeter to park in front of the waiting multitudes. With steps in position, the crew acknowledged the greeting from the crowd with the US and UK flags flying above the flightdeck. It was an occasion worthy of recording pictorially by the press. Unfortunately all representatives present were entombed in two buses parked behind the 747 owing to an over enthusiastic security organisation.

Soon after its arrival, *Enterprise* was saluted by *Sally B*, the B-17 from Duxford, which made a couple of passes over the area. The opportunity was also taken by Air UK to gain some valuable publicity for its local operation. The airline's new Shorts 330 was parked under the tail of the 747 and formally named *Enterprise*. This inspired act was followed by the distribution of stickers welcoming Stansted's other major carrier!

It was at the beginning of May that the National Aeronautics and Space Administration (NASA) announced that the Space Shuttle would be visiting Europe to take pride of place at the Paris Air Show. Prior to this exhibition a short stay at Cologne was arranged, but it was the Stansted appearance that was of main interest to the UK public. The authorities had little more than a month to transform a normally tranquil airport into the site for this American extravaganza. It was chosen because of its 10,000ft runway, proximity to London and its ease of access from all directions. Certainly there is a motorway and an east-west main road nearby, but owing to the years of political indecision, objections and enquiries, the airport still rejoices in approach roads to country lane standards. It was inevitable that there would be chaos. Considering this built-in handicap, the organisers achieved a remarkably successful operation both on and off the field.

Orbiter OV-101 *Enterprise* was rolled out as long ago as September 1975. The intention had been to name the machine *Constitution*, but such was the lobbying by fans of the TV series *Star Trek*, that the change was made shortly before its first appearance. In fact, it has never been into space, acting instead as a test vehicle for later craft.

In order to prove the Orbiter's flying characteristics, it was necessary to launch it at altitude from a carrier aircraft. At first a specially designed machine was considered, but the expense and time delay were unacceptable. Instead NASA purchased Boeing 747 N9668 for $16million from American Airlines in mid-1974, dispatching the airliner to Boeing for the necessary modifications. These included the installation of additional bulkheads, skin reinforcement and the provision of a fin at the tailplane tips to give directional stability when carrying the Orbiter. To facilitate this three pylons, two aft and one forward, were mounted on top of the fuselage, matching the attachment points provided for the external fuel tank used during ground launches. The forward pylon extends to raise the craft's nose for separation in flight, or retracts to a low position during ferry flights.

By 1977 both aircraft were ready for the trials to begin. Carried out at Edwards Air Force Base in California, the programme called for 13 flights in three phases. The first batch involved five unmanned trips with the Orbiter firmly attached to the 747, all of which were successfully completed between 18 February and 2 March. The second phase came in June-July when three flights were carried out with the astronaut crews on board, giving them the opportunity to try out the flight systems without actual separation. Again everything proved satisfactory with no serious problems developing.

Enterprise was finally released for its first free flight on 12 August, piloted by Fred Haise and Gordon Fullerton. The crew fired explosive bolts to release the Orbiter from the mother ship, and then made an unpowered landing at Edwards AFB. The protective tail cone remained in place on this and the following two flights in order to reduce drag and turbulence. For the maiden trip, *Enterprise* was released at 24,000ft, its flying time amounting to just 5min 22sec.

The tail cone was removed on 12 October for the spacecraft's fourth free flight. Two simulated main and orbital manoeuvring engines were installed this time to test the stability of the machine particularly during its approach and landing. Separation was made at 25,200ft, *Enterprise* demonstrating that there was a considerable increase in drag without the cone in position. Descent was at a much steeper angle than previously experienced, with touchdown at 185kts.

The last free flight of the Orbiter was on 22 October 1977, piloted by Haise and Fullerton once again. Released at 19,900ft, it flew a straight-in approach to Edwards AFB landing after only 2min 1sec. It proved that the craft could safely be landed within the limits of the available 15,000ft runways at both Kennedy Space Center and Vandenberg AFB, the sites for future planned landings after space missions.

Following these successful test flights, *Enterprise* flew no more without the assistance of the carrier 747. The spacecraft did however continue to contribute to the Shuttle programme by carrying out ground structural and vibration tests prior to the orbital flights by the second machine, *Columbia*. It also served as a model for fitting to the transporters at Kennedy Space Center and will be used for similar checks at Vandenberg AFB from where polar orbit flights are scheduled to be launched.

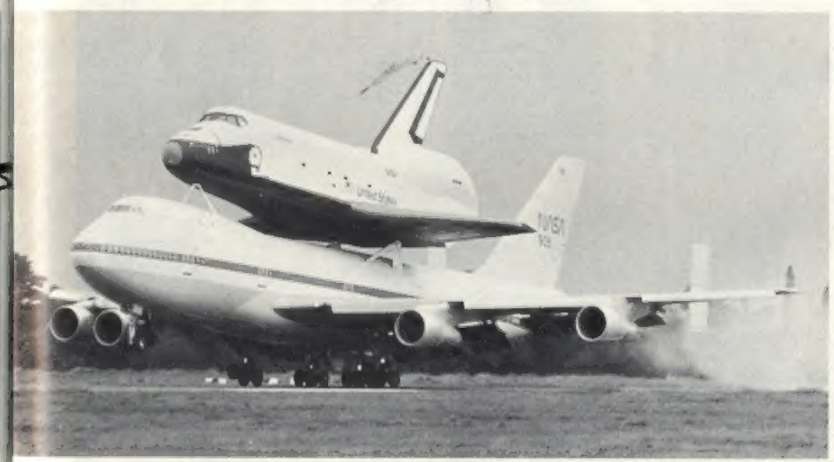
Enterprise was converted into a ground test machine for cost reasons, taking over from OV-99 *Challenger* which was originally earmarked for this work. Already the Orbiter has donated some of its components to *Columbia*, while other items have been installed for fitting and functional tests before going into space on board one of the operational craft. At the conclusion of this employment, *Enterprise* will become a permanent museum exhibit, having played a major role in the success of the Shuttle project.

The four planned orbital test flights were completed by *Columbia* in July 1982, paving the way for the first truly operational sortie. This was carried out in November 1982 when the spacecraft took a crew of four aloft to deploy a couple of communication satellites in orbit. *Challenger* became the second production orbiter to join the fleet, making its debut in space in April 1983. Again satellites were unloaded while aloft, the trip also giving two of the crew the opportunity for a space walk. For its next mission for June, the five person crew included Sally Ride, the first American female in space. The third machine in the four craft fleet will be *Discovery*, due to participate in the mission scheduled for March 1984. The last Orbiter will be *Atlantis*, intended for launch in April 1985 on the 21st operation.

In the future, Shuttle flights will become more and more frequent, inevitably ceasing to be newsworthy. However, the visitors to Stansted plus the millions who watched the pair majestically fly low along runways or over cities will remember the impressive sight of *Enterprise* for a long time. Who knows, perhaps one day one of its successors may make a free landing at Stansted. A start had better be made forthwith on the improvement of the approach roads!

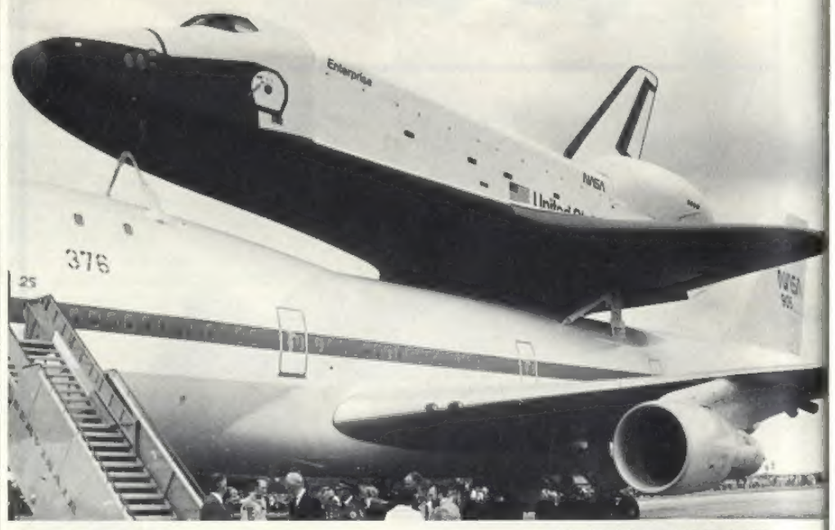
Left: Shuttle fever — the piggy-backed combination of Orbiter *Enterprise* atop Boeing 747, N905NA, taxying-in at Stansted on 5 June. *All photos by the author unless otherwise credited*

Below left: On 20 May, over 15,000 people crowded into Fairford for the one-hour refuelling stop-over en route to the Paris Air Show. *Photo: Peter R. March*



Above: A smooth touchdown for the carrier and Orbiter at Stansted on 5 June.

Left: This view emphasises the size of the Shuttle. It is actually some 22ft longer than a Boeing 737, while its wingspan is about 15ft less. Removal from the back of the carrier is not possible without the aid of the special lifting structure used in the US.



Boelcke Squadrons' farewell to the Starfighter

Photo report by **Ben Ullings** *and* **Gregor R. Heinrichs**

On 30 April *Jagdbombergeschwader 31 (JBG31)*, bade farewell to the Lockheed F-104G Starfighter by means of an Open Day and fly-in at Nörvenich AB. Blessed by beautiful weather, the event drew thousands of spectators and some 150 light aircraft from West Germany and abroad.

The 'Geschwader Boelcke', as the unit is officially named after Hauptmann Oswald Boelcke, a famous WW I fighter pilot, is one of the oldest squadrons in the *Luftwaffe*. It was formed at Büchel on 1 September 1957 and transferred to Nörvenich in January 1958. A year later, *JBG31* then operating the F-84F Thunderstreak, became the first West German flying unit fully committed to NATO. In 1961 the 'Streaks' were transferred to *JBG36* at Rheine-Hopsten and Nörvenich started to prepare for the Starfighter.

The Wing retained operational status again in July 1962 and three years later the intensive-training programme culminated in the attainment of active NATO-status. By January 1973 the Wing had accumulated 100,000 flying hours, a figure that had reached 240,000 by the end of April this year; almost 210,000 of these were performed by the Starfighter. *JBG31* will be the first *Luftwaffe* unit to introduce the Tornado and the first examples are due at Nörvenich in early August.

To mark the retirement of the Starfighter from *JBG31* service, one aircraft (TF-104G, 28+31) was specially painted in a commemorative colour scheme that represented the unit's badge. The idea behind 28+31 came from Lt Gereon Nellessen and he, together with Oblt Heribert Mennen and a small group of enthusiasts, painted the aircraft in their spare time.

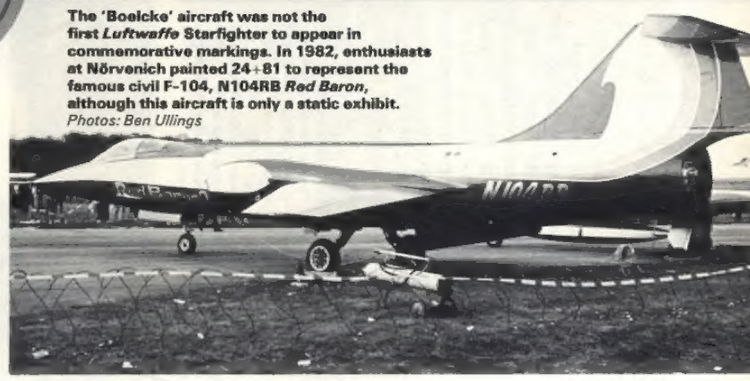
Below: Another view of the 'Boelcke' Starfighter which clearly shows the clever way in which the unit's badge has been applied to the aircraft.
Photo: H. P. Jans via Gregor R. Heinrichs

Below: TF-104G Starfighter, 28+31, specially painted to commemorate the retirement of the type from *JBG31* service. Note the sword of the unit's badge extending from the tailfin to the air intake.
Photo: Pieter van Gemert

Right: Wearing a spiked helmet(!), goggles and a leather flying jacket, Oberst Gert Overhoff, CO of *JBG31*, revives the times when Oswald Boelcke gained his many aerial victories.

A James Bond-like display was performed by the crew of a *Luftwaffe* UH-1D SAR helicopter during the Open Day held at Nörvenich on 30 April.

The 'Boelcke' aircraft was not the first *Luftwaffe* Starfighter to appear in commemorative markings. In 1982, enthusiasts at Nörvenich painted 24+81 to represent the famous civil F-104, N104RB *Red Baron*, although this aircraft is only a static exhibit.
Photos: Ben Ullings



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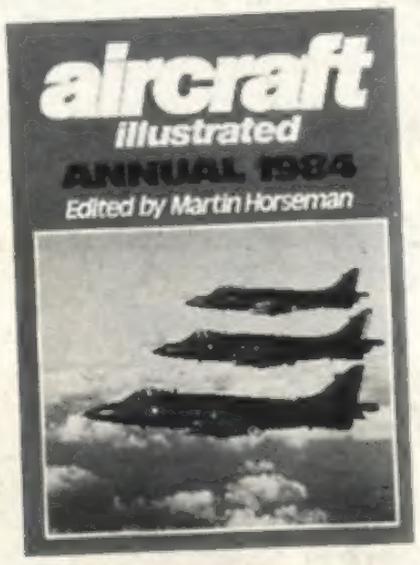

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